

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 - - - - -X
4 In the matter of: :
5 METROPOLITAN EDISON COMPANY :
6 (Three Mile Island Unit 1) :
7 - - - - - :
8

Docket No. 50-289
(Restart)

25 North Court Street,
Harrisburg, Pennsylvania

Tuesday, February 17, 1981

11 Evidentiary hearing in the above-entitled
12 matter was resumed, pursuant to adjournment, at 10:05 a.m.

13 BEFORE:

- 14 IVAN W. SMITH, Esq., Chairman,
Atomic Safety and Licensing Board
- 15 DR. WALTER H. JORDAN, Member
- 16 DR. LINDA W. LITTLE, Member

17 APPEARANCES:

18 On behalf of the Licensee, Metropolitan Edison
19 Company:

- 20 GEORGE F. TROWBRIDGE, Esq.
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8 On behalf of the Consumer Advocate, Commonwealth of
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14 On behalf of the Pennsylvania Public Utilities
15 Commission:

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20 On behalf of Three Mile Island Alert:

21 LOUISE BRADFORD

22 On behalf of the Regulatory Staff:

23 JAMES TOURTELLOTTE, Esq.
24 DANIEL SWANSON, Esq.
25 Office of Executive Legal Director,
United States Nuclear Regulatory Commission,
Washington, D. C.

Petitioners for leave to intervene pro se:

MARJORIE M. AAMODT,
NORMAN AAMODT,
R.D. 5,
Coatesville, Pennsylvania

C O N T E N T S

| | | | | | | | |
|-----------------|---------------|--------------|-----------------|----------------|--------------|--------------|-----------------|
| <u>WITNESS:</u> | <u>DIRECT</u> | <u>CROSS</u> | <u>REDIRECT</u> | <u>RECROSS</u> | <u>BOARD</u> | <u>CROSS</u> | <u>ON BOARD</u> |
|-----------------|---------------|--------------|-----------------|----------------|--------------|--------------|-----------------|

Bruce Boger (Resumed)

| | | | | | | | |
|----------------|--------|--------|--|--|--|--|--|
| By Mr. Swanson | 12,785 | | | | | | |
| By Ms. Aamodt | | 12,787 | | | | | |

Afternoon Session p. 12,866

Bruce Boger (Resumed)

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|-----------------|--------|--------|--|--------|--|--------|--|
| By Ms. Aamodt | 12,867 | | | | | | |
| By Mr. Dornsife | 12,867 | | | | | | |
| By Mr. Swanson | | 12,876 | | | | | |
| By Mr. Smith | | | | | | 12,877 | |
| By Dr. Jordan | | | | | | 12,878 | |
| Ms. Aamodt | | | | 12,879 | | | |

Marjorie M. Aamodt

| | | | | | | | |
|---------------|--------|--------|--|--|--|--|--|
| By Mr. Aamodt | 12,886 | | | | | | |
| By Mr. Blake | | 12,935 | | | | | |

Prepared Direct Testimony of Marjorie Aamodt, and attachments thereto.....pp 12,931

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PROCEEDINGS

1

CHAIRMAN SMITH: Good morning.

2

3

Is there any preliminary business?

4

MR. BLAKE: Mr. Chairman, one matter of scheduling.

5

I would like to set aside Friday morning for Mr.

Dieckamp's testimony, if I might.

6

CHAIRMAN SMITH: For --

7

MR. BLAKE: Mr. Dieckamp's testimony.

8

DR. JORDAN: Friday?

9

MR. BLAKE: Yes, sir.

10

CHAIRMAN SMITH: Okay. Very good. No objections

11
12 to it.

13

MR. BLAKE: If we wrap up everything else we

14 intended to do this week, I would endeavor to try to get him

15 here earlier, but I would like to set that aside.

16

CHAIRMAN SMITH: Okay.

17 We found that a 12:30 adjournment time on Friday

18 is not early enough. It is going to have to be 12:00

19 o'clock and no later than 12:00 o'clock. It means we

20 adjourn at 12:30 and the rest of the afternoon is quite

21 frantic, so we do not think a half hour accomplishes that

22 much, so we will be adjourning at 12:00 o'clock. We will

23 continue to start at 8:30.

24 MR. BLAKE: I am not aware that Mr. Dieckamp's

25 testimony addresses one of the Commission issues but is not

1 directly tied to any of the Intervenor issues.

2 CHAIRMAN SMITH: Anything else of a preliminary
3 nature?

(No response.)

5 CHAIRMAN SMITH: Okay. I think we are ready then
6 to begin the cross examination of Mr. Boger.

7 MR. SWANSON: Excuse me, Mr. Chairman. I did want
8 to have the opportunity to ask Mr. Boger if he had any
9 additional corrections or additions to his testimony, a
10 couple of things we wanted to point out that I did not get
11 on the record last Friday.

12 Whereupon,

13 BRUCE BOGER,
14 the witness on the stand at the time of recess, resumed the
15 stand, was further examined and testified as follows:

16 DIRECT EXAMINATION -- Resumed

17 BY MR. SWANSON:

18 Q Mr. Boger, do you have any additions or
19 corrections to either of your two pieces of testimony?

20 A I have an additional change, or a change to my
21 testimony on Aamodt Contention No. 2, and it is in the
22 answer to Question 5. The answer should read "If the
23 facility is allowed to restart, we plan to administer the
24 operating portion of the NRC examination to all license
25 operators approximately 30 days" --

1 CHAIRMAN SMITH: Slow down, please.

2 THE WITNESS: I am sorry.

3 CHAIRMAN SMITH: You inserted the words "operating
4 portion."

5 THE WITNESS: Of the NRC.

6 CHAIRMAN SMITH: Okay.

7 THE WITNESS: I inserted "the operating portion of
8 the NRC" in between "administer" and examination." After
9 that sentence, which, "approximately 30 days prior to the
10 restart of the facility." insert an additional sentence
11 which states, "The written portion of the NRC examination is
12 presently scheduled for April 1981." That is the correction
13 that needed to be made.

14 BY MR. SWANSON: (Resuming)

15 Q Do you have an addition to make to that testimony
16 also?

17 A Yes. At the time that I prepared the testimony,
18 or since the time that I prepared the testimony, the
19 Operator Licensing Branch in the NRC has added two human
20 factors psychologists to the branch. They came on board
21 about the 2nd of February. It is too early to see exactly
22 what they will be doing, but they have been added to the
23 staff with the hopes of looking at our examinations and our
24 teaching and learning process, to look at our examinations.

25 MR. SWANSON: Thank you. I have nothing further.

1 (Pause)

2 CHAIRMAN SMITH: All right.

3 CROSS EXAMINATION

4 BY MS. AARODT:

5 Q Mr. Boger, I think I will just begin with the last
6 thing that you said, which will be an addition to the
7 testimony, and then I will go, Mr. Smith, directly to my
8 cross questionning.

9 You said you are adding human factors
10 psychologists to the program. Could you tell me what their
11 background is? Is it in psychology or in what is called
12 human engineering?

13 A I understand that their backgrounds are as
14 teachers in the teaching field.

15 Q Teaching what?

16 A I am not sure.

17 Q Have they had experience in specifically test
18 construction or analysis of tests?

19 A I do not know.

20 Q Have you had that kind of education, Mr. Boger?

21 A Have I?

22 Q Have you had that education in test construction,
23 test analysis?

24 A No, I have not.

25 Q Have you consulted with anyone, for instance

1 Educational Testing Service in Princeton?

2 A I have not.

3 Q Some of the categories covered by the written
4 examination for licensing reactor operators are designated
5 in Section 55.21, is that correct?

6 A Some of the areas which must be covered are
7 designated in Part 55.

8 Q Yes. So some of the categories are -- there have
9 been additions to the 12 categories in Section 55.21, is
10 that correct?

11 A That is correct.

12 Q Are they -- the tests on heat transfer and fluid
13 mechanics referred to in NUREG-0660, Task I.A.3-4.

14 A I do not have that NUREG.

15 Q You refer to that in your testimony. Perhaps you
16 could look at that.

17 MR. BLAKE: Mrs. Aamodt, what was the task number
18 again?

19 MS. AAMODT: It is NUREG-0660.

20 MR. BLAKE: In 0660, what was the task action
21 number?

22 MS. AAMODT: Task I.A.3-4.

23 CHAIRMAN SMITH: It is on page 3.

24 THE WITNESS: My testimony refers to Item I.A.3.

25 BY MS. AAMODT: (Resuming)

1 Q It says there that all reactor operator license
2 applicants shall take a written examination with a new
3 category dealing with principles of heat transfer and fluid
4 mechanics, a time limit of nine hours and a passing grade of
5 80 percent and 70 percent in each category.

6 Now, is that in addition to your test?

7 CHAIRMAN SMITH: Mrs. Aamodt, we are having the
8 same problem that we had before.

9 Are you looking right at Mr. Boger's testimony?

10 MS. AAMODT: Yes.

11 CHAIRMAN SMITH: All right.

12 Is that on page 3?

13 MS. AAMODT: He is referring to changes required
14 in this area are identified in NUREG-0660, Item I.A.2. Now,
15 I did not find it in I.A.2 but I found it in I.A.3.

16 MR. SWANSON: The testimony does say 3. It is
17 page 3.

18 CHAIRMAN SMITH: Will you actually look at page 3?

19 MS. AAMODT: I am not looking at page 3.

20 DR. JORDAN: I think the confusion is in answer to
21 Question 7 he refers to Item I.A.2.

22 MS. AAMODT: Yes, there it is, at the top of page
23 3. They are identified in NUREG-0660, Item I.A.3.

24 DR. JORDAN: Yes.

25 MS. AAMODT: So I am just asking --

1 CHAIRMAN SMITH: I just want to clarify. Your
2 question, however, referred to Item. I.A.3-4. That was a
3 mistake apparently.

4 MS. AAMODT: Page 4 of that.

5 CHAIRMAN SMITH: Page 4.

6 MS. AAMODT: Yes.

7 BY MS. AAMODT: (Resuming)

8 Q Is that correct?

9 A Could you repeat the question, please?

10 Q Are they -- are the additions to the twelve
11 categories covered in Section 55.21 for reactor operators
12 listed in NUREG-0660 Task I.A.3?

13 A Referring to my testimony, I would think that
14 those categories are included in the action plan.

15 Q Either the tests on heat transfer and fluid
16 mechanics?

17 A There are sections in the exam covering those
18 items.

19 Q And this is in addition, is that correct?

20 A That is correct.

21 Q Yes.

22 What level grade-wise do you estimate that these
23 tests are.

24 A What level?

25 Q In an engineering framework?

1 A I think most engineers receive thermodynamics and
2 heat transfer courses in their second or third year.

3 Q But that wasn't the question I asked you. I asked
4 you what level the courses that you are giving are. Would
5 they be a second or third year level, these tests? Would
6 these kinds of tests follow a second or third year level
7 thermodynamics course in engineering school?

8 A I could not compare it to an engineering course.

9 Q Have you done that? Have you looked at those
10 tests?

11 A Yes, I have.

12 Q Are they harder or easier?

13 A I think they have a different slant than the
14 engineering school type examinations. Engineering school
15 type examination is directed more toward the theoretical and
16 the derivation of equations and principles, whereas the
17 examinations we give or the areas that we cover are more
18 toward the practical application of those principles.

19 Q Would you call it more descriptive than
20 analytical? Could that -- would that be a fair comparison?

21 A I think that would be fair.

22 Q Are they more problem solving or recall?

23 A Problem solving.

24 Q They are problem solving.

25 A We often give situations and require the operator

1 to respond as to what he would do to reduce the problem or
2 why he would act in a certain way.

3 Q Is that on the basis of his solving the problem,
4 or your having solve it and told him what to do?

A I have not told the operator what to do.

6 Q The trainer, the trainer having told the operator
7 what to do? Does he figure out what the solution should be
8 or does he remember what he was told it should be?

9 A I am sure it is a combination of both. He has to
10 rely on his training in the areas where he has not been
11 directly told an answer.

12 Q What level of mathematics are required to pass
13 this examination?

14 A We do not require any level of training which
15 would require the use of calculus.

16 Q The use of calculus did you say?

17 A Yes, ma'am.

18 Q What, integral or differential?

19 A We do not require anything that would -- up to
20 that level.

21 Q I am sorry. Perhaps you misunderstood my questin.
22 In order to successfully pass the examination in
23 this category, approximately what level of mathematics would
24 you need?

25 A High school. High school.

1 Q High school mathematics.

2 A Equivalent math.

3 Q How do these tests differ from those in Category E
4 of 55.21?

5 In looking through the old test, it seemed that
6 some of this material was already contained in Category E of
7 55.21, E.

8 A That is correct. Our exams did, prior to the TMI
9 2 accident include some knowledge of heat transfer, fluid
10 flow thermodynamics.

11 Q Could you compare the two tests, the two
12 categories, now? Have they been revised?

13 A You are referring to a Category E?

14 Q. Category E with the present -- with this addition
15 of this new category on heat transfer and fluid mechanics.

16 A Category E in the past may have had one question
17 in this area. The new category would have five or six
18 questions in the area of thermodynamics, heat transfer and
19 fluid flow.

20 Q About one question to five or six, is that correct?

21 A Basically yes.

22 Q Yes.

23 I understood from this NUREG-0660 I.A.3 that this
24 time limit was nine hours for five questions?

25 A No, ma'am. That is nine hours for the entire

1 exam. The exam has eight categories, of which this is just
2 one of those eight categories.

3 Q I am sorry. This is the entire NRC examination,
4 then, the nine hours are.

5 A Yes, ma'am.

6 Q Oh, all right.

7 What proportion of the total test score, if the
8 test score was 100 percent, would these five questions on
9 heat transfer and fluid mechanics contribute to that score?

10 A About 12 percent.

11 Q 12 percent. And prior, with the one question,
12 approximately?

13 A I could not give you a number for that.

14 Q And I am -- will ask you -- I will tell you what I
15 am planning to ask you so that we can go through it
16 quickly. It is the parallel questions for the SRC
17 examinations, the senior reactor operator examination. Some
18 of the categories covered by the written examination for
19 licensing of the senior reactor operators include those in
20 Section 55.21, and an additional nine categories described
21 in Section 55.22.

22 Is that correct?

23 A Except the part 55 is addressing subjects which
24 must be covered, whereas the exam takes those subjects and
25 compresses them into categories.

1 Q All right. But the scope, then, of the SRO
2 examination is described in 55.21, and .22, is that correct?

3 A 55.22 addresses the scope of the senior reactor
4 operator exam.

5 Q And it was an additional 55.21, is that correct,
6 or do they have --

7 A 55.21 is for the content of the reactor operator
8 written examination.

9 Q All right.

10 The revised NRC licensing exam for senior reactor
11 operators will also include tests on the theory of fluids
12 and thermodynamics as described in NUREG-0660 Task I.A.3, is
13 that correct?

14 A That is correct.

15 Q How do those new tests differ from those in the
16 category of 55.22? There is a category -- well, you would
17 know, on F, including coolant chemistry and effects, causes
18 and effects of temperature. How many questions? Could you
19 compare that to the senior operator exam?

20 A I think this whole conversation will parallel
21 that of the reactor operator examination; whereas we
22 included some questions in heat transfer or fluid dynamics
23 in the senior operator examination prior to the accident,
24 now we have an entire category devoted to that subject.

25 Q And you would compare it, number of questions?

1 A Again about five or six to one.

2 Q To one, yes.

3 And what level is this examination, the tests for
4 this? What level college-wise or high school-wise would
5 these tests be able to be completed successfully?

6 A Well, it is about the same level as for the
7 reactor operator.

8 Q About the same level.

9 A Yes.

10 Q And the proportion, I suppose, that contributes to
11 the 100 percent test score would be again 12 percent, about?

12 A I believe it is a little more on the senior exam
13 because there is only six categories. It is not quite
14 one-sixth of the exam.

15 Q Are there any other additions to the revised NRC
16 licensing examinations other than those just discussed?

17 A Well, I believe we, in the testimony, we discuss
18 the passing criteria, the new grading criteria for passing
19 the exam.

20 Q No. I meant are there any additions to the
21 examination other than those just discussed?

22 A No.

23 Q No?

24 I am on page 2 now. Several conversations I have
25 had with NRC have indicated my concern about the validity of

1 your tests.

2 Is that a concept that you have wrestled with in
3 constructing these tests?

4 A I believe so, yes.

5 Q Are the licensing exams valid?

6 A We believe they are, yes.

7 Q In predicting control room performance? How have
8 you determined that?

9 A I do not believe we can use them as a predictor of
10 performance after the exam. We can only test for
11 demonstrated knowledge at the time of the exam.

12 Q So there was no attempt to determine whether they
13 were valid or not?

14 A That is not exactly true. The examiners have had
15 a lot of experience in the operation of nuclear power
16 plants. We have seen how they operate. We understand what
17 an operator has to know in order to perform his job, and we
18 base the tests on that experience and knowledge.

19 Q So it is an informal type of validity. You do not
20 systematize it in any way.

21 A That is correct.

22 Q Or -- all right.

23 Were the NRC licensing exams given to the TMI 2
24 personnel valid in predicting control room performance, do
25 you believe?

1 A I do not know.

2 (Mr. and Mrs. Aamodt conferring.)

3 BY MS. AAMODT: (Resuming)

4 Q Who would know if they were valid?

5 A I do not know.

6 Q What are your objectives in giving the new NBC
7 licensing exams?

8 A I guess the testimony addresses that. I would say
9 the NBC examinations are designed to give us reasonable
10 assurance that individuals can safely and competently
11 operate the facility.

12 (Mr. and Mrs. Aamodt conferring.)

13 BY MS. AAMODT: (Resuming)

14 Q Didn't you just say in your prior answer that you
15 could not do that with these tests?

16 A In an absolute sense. I believe I just said we
17 need reasonable assurance that we need to be able to do that.

18 Q Looking at NUREG-0660 Task I.A.2, page 1 -- do you
19 have a copy of that, Mr. Boger?

20 A No, I do not.

21 MS. AAMODT: Do you think -- could I provide my
22 copy to Mr. Boger?

23 CHAIRMAN SMITH: What is the --

24 MS. AAMODT: Could I provide my page to Mr.
25 Boger? I have it written here. I do not need it.

1 (Ms. Aamodt handing document to witness.)

2 MR. SWANSON: Is there going to be extensive
3 questioning on this document? If so, we could --

4 MS. AAMODT: Just on that page.

5 MR. SWANSON: Okay.

6 CHAIRMAN SMITH: This is on -0660?

7 MS. AAMODT: -0660, NUREG-0660.

8 (Pause)

9 CHAIRMAN SMITH: Are you waiting?

10 DR. JORDAN: Where do we stand? Did he get a copy?

11 THE WITNESS: She has given me her copy.

12 BY MS. AAMODT: (Resuming)

13 Q Okay. NUREG-0660, Task I.A.2, under "Objectives"
14 states the objectives of new training and qualification
15 requirements.

16 You have read that, Mr. Boger?

17 (Witness reviewing document.)

18 THE WITNESS: Yes. It says even more than that.

19 BY MS. AAMODT: (Resuming)

20 Q What is that?

21 A I said it says even more than that.

22 Q What says even more than that?

23 A You read part of the statement of the objective of
24 the program, and I am saying that it does that and other
25 things.

1 Q Other things? You mean qualifications for
2 experience and that sort of thing? Is that what you are
3 talking about?

4 A Educational experience and training requirements.

5 Q Yes.

6 All right. Would you say that these objectives
7 are responsive to the August 9 Board Order Item I.E? It is
8 on page 5 of the Commission's Order, that is, to augment the
9 retraining of all reactor operators and senior reactor
10 operators assigned to the control room, including training
11 in the areas of natural circulation and small break loss of
12 coolant accidents, including the revised procedures and the
13 TMI 2 accident.

14 A The action plan item is more comprehensive than
15 the order item I.E.

16 Q Would you say that these -- yes, that is what I
17 was saying to you. Are those objectives attempting to
18 respond to this Board Order I.E?

19 A I am not sure how they relate. I can only make
20 the comparison I made just a second ago, that the task
21 action plan is more comprehensive than the order item.

22 Q But was the task action plan responsive to the
23 August 9 order? Isn't that -- isn't --

24 A I think the task action plan was responsive to
25 several things, more than just any one order item. It also

1 had the lessons learned requirements. It also had the
2 bulletins and orders that were issued. It was just one --
3 might have been one facet. I cannot even say it was one
4 facet.

5 I did not develop the action plan, so I cannot
6 answer your question directly.

7 Q Well, I do not know. Would you like to look at
8 the Board Order to see whether you think that is --

9 CHAIRMAN SMITH: Maybe this would be helpful.

10 MS. AAMODT: Yes.

11 CHAIRMAN SMITH: There is a basis for confusion
12 about what you are trying to accomplish by your questions.
13 It could be taken several ways. One is was the objective
14 set forth in 0660 intended to be a response to the
15 Commission order? That is one version of it. Or having
16 been issued, does the staff point to it as being responsive
17 to the Commission order? That is one version of the
18 question. Or it could be just was it coincidentally
19 responsive to the Commission's order?

20 MS. AAMODT: I like number two.

21 CHAIRMAN SMITH: You like number two.

22 MS. AAMODT: Would you say that again, Mr. Smith?

23 CHAIRMAN SMITH: All right. That was does the
24 staff rely upon that objective as its compliance with the
25 Board order? That is not exactly the way I said it that

1 time.

2 MS. AAMODT: That is good, yes.

3 BY MS. AAMODT: (Resuming)

4 Q Does the staff look on the objectives stated here
5 as compliance, meeting those objectives as compliance with
6 the Board order?

7 A I think if you comply with Item I.E.2 you do
8 comply with Order Item I.E.

9 Q The first objective, improve the capability of
10 operators and supervisors to understand and control complex
11 reactor transients and accidents, will you measure for this
12 capability on the written exam?

13 A We will examine in this area on the exams.

14 Q Could you --

15 CHAIRMAN SMITH: How will you determine, then, if
16 you are able to tell us whether this objective is realized?

17 THE WITNESS: I think that we are taking one part
18 of this objective -- and this task action plan has many
19 items associated with it regarding training, qualifications,
20 upgrading of exams, new exam scores, time limits, and we are
21 picking on one part of it, and that is why I am having
22 trouble answering the question. We will examine people on
23 this area, the reactor transients and accidents.

24 (Mr. and Mrs. Aamodt conferring.)

25 CHAIRMAN SMITH: I think that Mrs. Aamodt needs a

1 better explanation of how the staff is then going from --
2 let's get the Board order item. Let's get that in the
3 record.

4 (Pause)

5 CHAIRMAN SMITH: All right, you already read part
6 of it. Let's get it into the record right now, all of Order
7 Item I.E, which appears on page 5 of the slip opinion. I.E,
8 "Augment the retraining of all reactor operators and senior
9 reactor operators assigned to the control room, including
10 training in the areas of natural circulation and small break
11 loss of coolant accidents, including the revised procedures
12 and the TMI 2 accident. All operators will also receive
13 training at the B&W simulator on the TMI 2 accident, and the
14 Licensee will conduct a 100 percent re-examination for all
15 operators in these areas. NRC will administer complete
16 examination to all licensed personnel in accordance with 10
17 CFR 55.20 to 23."

18 Now, what portion of this order does your
19 testimony undertake to address, if anything?

20

21

22

23

24

25

1 THE WITNESS: My testimony did not address Order
2 Item Number 1E by itself. That was addressed in the Restart
3 Report or the SER.

4 CHAIRMAN SMITH: So your testimony is to the
5 specific part of the Order as it is anticipated by Mrs.
6 Aamodt's Contention 2?

7 THE WITNESS: I believe some of the areas were
8 covered. I did not have the benefit of Mrs. Aamodt's
9 Contention prior to writing the SER, so I did not use it as
10 I wrote the SER.

11 CHAIRMAN SMITH: I was talking about your
12 testimony.

13 THE WITNESS: I did use her Contention when I
14 wrote my testimony, but I did not refer back to the Order
15 Item.

16 CHAIRMAN SMITH: Okay. Now, to what extent are
17 you competent to tell us what portions of Commission Order
18 I.E are being met? What area comee within your particular
19 responsibilities?

20 THE WITNESS: I was responsible for reviewing the
21 TH1-1 OARP with respect to compliance with Order Item I.E.

22 CHAIRMAN SMITH: Anything further? Well, the last
23 sentence, you are going to have to administer the test.

24 THE WITNESS: Okay. Subject to successful
25 completion of the NRC examinations --

1 CHAIRMAN SMITH: Yes. Okay.

2 (Mr. and Mrs. Bamodt conferring.)

3 BY MRS. AAMODT: (Resuming)

4 Q Maybe I can clear my own confusion up at this
5 point. Are you -- are you are the person, then, who is to
6 see that Order I.E is satisfied; is that true?

7 A Yes.

8 Q You are?

9 CHAIRMAN SMITH: Let's be careful about that. Are
10 you responsible -- you have to be careful about your
11 answers. You cannot be responsible for the portion which
12 says "Licensee shall conduct 100-percent reexamination of
13 all operators." I mean you are not the Licensee or an agent
14 of the Licensee.

15 Do you have -- I think you better have this Order
16 Item before you when you testify. Now, maybe you are
17 responsible for ascertaining that the Licensee has done it.

18 THE WITNESS: That is what I am supposed to do.

19 CHAIRMAN SMITH: All right.

20 BY MRS. AAMODT: (Resuming)

21 Q So I am asking you again on the first objective
22 where your measure is of compliance with that objective.

23 A Passing the NRC examination.

24 Q What's that?

25 A Passing the NRC examination.

1 Q And how does -- what proportions of the exam
2 measure this? What categories in the examination should I
3 ask you measure this capability? How -- how reasonably is
4 this capability measured, how adequately?

5 A I cannot address that.

6 CHAIRMAN SMITH: Well, let's go back over those
7 two questions. Would you repeat them for me, please? You
8 know, "How accurate is what the objectives on page 1A to --

9 MRS. AAMODT: Not the objectives, Mr. Smith.
10 Meeting the objectives.

11 CHAIRMAN SMITH: Meeting what objectives?

12 MRS. AAMODT: Meeting the first objective: to
13 improve the capability of operators and supervisors to
14 understand and control reactor transients and accidents, how
15 -- what kind of a measure does he have and -- and how is it
16 quantified in terms of numbers of questions and the
17 proportion those questions contribute to total examination
18 score?

19 CHAIRMAN SMITH: All right.

20 MRS. AAMODT: Adequacy of those questions, that
21 kind of thing.

22 CHAIRMAN SMITH: I think that there is an apparent
23 inconsistency, or at least an unexplained aspect of your
24 testimony that requires clarification. You testified that
25 you are responsible for implementing Order Item I.E and

1 seeing the Licensee has complied with those requirements and
2 testing. And then you testified that you can -- you do not
3 know if your tests will adequately determine whether those
4 objectives have been realized. And somewhere the staff is
5 going to have to come up with an explanation of what seems
6 to me to be a void in the staff's presentation.

7 THE WITNESS: She asked me if I could quantify
8 what -- what to expect, and I do not think I can do that.

9 CHAIRMAN SMITH: That is the predictor. But now
10 she is -- that is the predictor part. Or is it?

11 THE WITNESS: Yes, sir.

12 CHAIRMAN SMITH: All right. Now she wants to know
13 generally speaking how valid -- I mean how good is the test
14 in determining whether the objectives of I.E have been met.

15 Board Order Item I.E, is that your question?

16 MRS. AAMODT: I am not asking prediction here.
17 Here I am simply asking: Do you have any measure of
18 capability? Do -- is there any measure of capability?

19 CHAIRMAN SMITH: Yes.

20 MRS. AAMODT: I do not know what they will do with
21 it.

22 BY MRS. AAMODT: (Resuming)

23 Q Is there any measurement of capability here?

24 CHAIRMAN SMITH: That is what I understand. You
25 are not asking for a predictor. You have already been over

1 that. You are asking how well do these tests ascertain how
2 capable the operators are in the context of the requirements
3 of Board Order Item I.E.

4 Do you have I.E there before you?

5 THE WITNESS: Yes, sir, I do. The specific items
6 that Order Item I.E addresses, which is training in the
7 areas of natural circulation and small-break loss-of-coolant
8 accidents, including revised procedures in the TMI-2
9 accident, those items are expected to be included in the NRC
10 examination.

11 CHAIRMAN SMITH: All right. And how good is the
12 examination at determining that the operators have achieved
13 a satisfactory level of competence in those areas?

14 Is that your question now?

15 MRS. AAMODT: How -- how -- how well is this
16 subject covered, essentially? How -- how many questions and
17 other -- other -- are there other -- it does not say here
18 that TMI-2 accident, but it says to understand and control
19 complex reactor transients and accidents.

20 CHAIRMAN SMITH: Now you have flipped over to the
21 other one. Take that up as a separate question.

22 MRS. AAMODT: All right. Okay.

23 CHAIRMAN SMITH: Now let's continue your
24 questioning on I.E.

25 BY MRS. AAMODT: (Resuming)

1 Q On I.E. how you plan -- I am sorry, maybe you
2 could help me.

3 (Mr. and Mrs. Aamodt conferring.)

4 BY MRS. AAMODT: (Resuming)

5 Q So you say that included in this examination are
6 questions on the TMI-2 accident and other loss-of-coolant
7 accidents; is that correct?

8 CHAIRMAN SMITH: I take it now, Mrs. Aamodt, that
9 you have withdrawn your earlier question; you are
10 approaching it from somewhat of a different angle?

11 MRS. AAMODT: Yes, I am.

12 BY MRS. AAMODT: (Resuming)

13 Q You have questions in your examination on the
14 TMI-2 accident and loss-of-coolant accidents?

15 A I anticipate that those questions will be on the
16 examination.

17 Q The examination has not been constructed?

18 A No, it has not.

19 Q I do not know how we can talk about something that
20 is not even there.

21 CHAIRMAN SMITH: Well, are you going to have a
22 role in devising the exam?

23 THE WITNESS: I believe I will, yes, sir.

24 CHAIRMAN SMITH: Do you have a basis to predict
25 what the exam questions will contain? I mean you have

1 already indicated certain areas which you know it will
2 contain.

3 THE WITNESS: Well, I guess we -- the NRC exam is
4 nothing new. It is -- we have been writing them for many
5 years, and this exam, because it has not been written does
6 not mean that it is going to be anything wildly different
7 than what we had before. I do not anticipate any problems
8 associated with writing the exam.

9 CHAIRMAN SMITH: The question is quite narrow.
10 And that is, as it relates to the loss-of-coolant accident
11 and the accident at TMI-2.

12 BY MRS. AAMODT: (Resuming)

13 Q You mean you have not been wrestling with what
14 kinds of questions can adequately and can validly and
15 reliably predict that these operators understand this
16 accident?

17 A No. We have been asking the questions for almost
18 a year now. What I was trying to get at is we have not
19 constructed this particular test, but the means of its
20 construction are not unknown to us. We still have to comply
21 with the requirements in Part 55 and the Denton letter of
22 March 28, 1980, which addressed the areas of examination.

23 Q If you have not wrestled with the questions that
24 would be valid to ask on the TMI-2 accident, how can I be
25 assured that you have wrestled with the questions on other

1 --

2 MR. SWANSON: Objection. It is contrary to the
3 testimony just given.

4 CHAIRMAN SMITH: I believe the objection is
5 correct. I do not think that you are -- that the premise of
6 your question is correct. He said that they have been
7 working on it, but the particular questions have not been
8 drafted yet.

9 MRS. AAMODT: They have been working on the TMI-2
10 accident.

11 BY MRS. AAMODT: (Resuming)

12 Q Have you been working on other complex reactor
13 transients and questions to address them?

14 A Yes, we have.

15 DR. JORDAN: Could I ask one question here? Have
16 you conducted an examination at other facilities,
17 particularly B&W facilities, which have included the TMI-2
18 accident and the loss-of-coolants?

19 THE WITNESS: Yes, I have.

20 BY MRS. AAMODT: (Resuming)

21 Q So you will revise the form, the specific
22 questions, but the form will be the same as used at these
23 other reactors regarding the TMI-2 accident?

24 A We take different parts of the TMI-2 accident and
25 ask questions on it. I am not sure what you are getting at

1 by "form." The concept is there, and we will write the
2 question to ask knowledge of a particular aspect of the
3 concept.

4 Q Okay. Is a requisite of this capability to -- to
5 address the TMI-2 accident and other reactor transients a
6 reasoning capability?

7 A Yes.

8 Q Do you measure that capability within the test
9 structure, or is it recall of what was taught?

10 A Well, in order to answer the question properly,
11 one has to perform some sort of reasoning to arrive at the
12 conclusion required by the question.

13 Q In other words, do you -- do you -- taking the
14 complex reactor transients other than TMI-2; TMI-2 has been
15 taught -- do you ask for solving of other problems as
16 serious as TMI-2 that have not been specifically taught?

17 A We --

18 CHAIRMAN SMITH: Excuse me. Is this question
19 parallel to the same question you asked on general operating
20 testing? If it is not, it seems to be the same question.

21 MRS. AAMODT: You mean --

22 CHAIRMAN SMITH: You are asking for --

23 MRS. AAMODT: -- the content? That was on heat
24 transfer and fluids. Now I am specifically addressing the
25 accidents. I am asking, you know, what level of math and

1 how they have to solve problems there. Now I am asking in
2 particular accident, descriptions of particular transients,
3 are they asking -- giving them these problem solving --

4 CHAIRMAN SMITH: All right. Yes. Okay. My
5 difficulty is earlier in your cross examination there did
6 not seem to be any trouble of getting questions and answers
7 back comparing the difference between reasoning on the test
8 and responding with what was already instructed. I do not
9 know why the difficulty should exist on this question.

10 MRS. AAMODT: I will try to do better, Mr. Smith.

11 THE WITNESS: Could you repeat the question,
12 please?

13 BY MRS. AAMODT: (Resuming)

14 Q Does your test include other problem solving for
15 other complex reactor transients than TMI-2?

16 A Yes.

17 Q Will the measurement of Objective 1 include other
18 complex -- I am sorry, I think that is a repeat. I think I
19 handled that earlier.

20 Okay, taking the second objective stated --

21 CHAIRMAN SMITH: You better repeat what the second
22 objective is.

23 BY MRS. AAMODT: (Resuming)

24 Q I am not completely sure what we learned by that,
25 and I do not know whether -- are you satisfied with what we

1 learned from --

2 CHAIRMAN SMITH: I am not satisfied that after I
3 interpose my observation, that you ask the same question
4 again. That is the problem. And I recall where you were.
5 You had already gone through a line of questioning in which
6 you determined that both training responses and reasoning
7 ability are tested in a certain line of examination. That
8 was back in the fluid dynamics section. Then I thought you
9 were asking parallel item questions on the TMI-2 accident
10 and small-break accidents.

11 And so when I interposed that observation, you
12 agreed that you were. However, then your question came back
13 somewhat different. It came back on accidents other than
14 TMI-2. So let's -- let's establish -- why can't we perhaps
15 be more efficient and establish in all of the tests given
16 under Order I.E and the objectives of NUREG-0660, do you
17 test both the reasoning ability or the analytical ability or
18 capability of the person being the candidate as well as his
19 response to training? I mean his -- the success of the
20 training.

21 THE WITNESS: Yes, we do.

22 CHAIRMAN SMITH: Both?

23 THE WITNESS: Yes, sir.

24 MRS. AAMODT: Mr. Smith, see, the object of this
25 particular questioning is only peripherally on content. But

1 the object of my questioning right now is on the validity of
2 the tests, how did the tests meet the objectives of the
3 Board order, and as stated in NUREG-0660.

4 CHAIRMAN SMITH: I got involved in it when your
5 question came up about the reasoning and the logic again.
6 And that seemed to be causing difficulty. Perhaps I should
7 not have interposed. But that seemed to be stopping the
8 exchange of questions and answers at that point.

9 MRS. AAMODT: Well, I was trying to figure out in
10 my own mind how far they had gone in meeting that objective.

11 CHAIRMAN SMITH: Right. Okay.

12 MRS. AAMODT: Whether it was simply recall of a
13 number of accidents or whether they had developed a process
14 of dealing with accidents and were able to test whether that
15 process was in place.

16 CHAIRMAN SMITH: Okay.

17 BY MRS. AAMODT: (Resuming)

18 Q You were saying you have a method within your
19 tests of testing whether the operator has the capability of
20 dealing with complex reactor transients of a wide variety.

21 A Yes.

22 Q How many questions about would be in the exam on
23 that? What proportion of the exam?

24 A On the reactor operator exam there are several
25 categories where one might expect to find questions dealing

1 with complex reactor transients and accidents. It is hard
2 for me to put a percentage number on it. I would guess
3 about, say, roughly 12 percent of the exam, maybe more than
4 that, on a particular accident.

5 We have to -- the different categories: The exam
6 would address instrumentation. It would address the
7 emergency equipment that may be used. It may address the
8 analysis of the transient, what will happen. So it is not
9 as hard and fast as you may like it to be or may expect me
10 to give you an answer. But there are several categories
11 within the exam that may address this concern.

12 Q In other words, you are saying the exam has maybe
13 a short answer that is indicative of more knowledge. Is
14 that the type of test method you are using?

15 A I do not think that that is true.

16 Q Well, do you give the operators the opportunity to
17 -- to in detail work out complex situations that they may be
18 presented with, show you how they would work them out?

19 A We would present them with the situation and ask
20 them to explain their actions and why. And that is an
21 essay-type question, so it goes beyond the short answer that
22 you suggested.

23 Q And about how many questions of that type are on
24 the examination --

25 A The entire --

1 Q To deal with this --

2 A We are back to where we were before. I cannot
3 give you a hard number on that.

4 Q About 12 percent you said; is that right?

5 A Might deal with the particular incident. I think
6 the way the exam is structured, there may be a third of it
7 that has to be do with emergency systems, maybe 50 percent.
8 I just cannot give you a number.

9 Q You have not analyzed your exam, then, in
10 constructing it?

11 A I have not analyzed it in the way that you are
12 referring.

13 Q Could you give me some idea how you analyzed this
14 examination, setting it up?

15 A Yes. I think basically when I construct an exam,
16 I consider the facility, I review the facility material.
17 And in the process of creating the exam, I will ask a
18 question in one category or create a question in one
19 category, and then I will keep that in mind that I have
20 asked a question on that system or on that transient, and
21 then in another part of the exam I will ask a question on a
22 different transient or different system.

23 And in the process of making up the exam I will
24 address many of the systems, trying not to repeat the same
25 question, and covering as much ground as possible.

1 Q So, informally, you are applying some type of a
2 test, some -- a test construction method, but you are not
3 doing it in a systematic manner, I gather. That is just an
4 aside. The -- all right, taking the second objective,
5 improve the general capability of an operations organization
6 to respond rapidly and effectively to upset conditions --
7 this is in NUREG-0660 -- will you measure for this
8 capability on the written exam?

9 A I do not think my testimony addresses the
10 capability of operations organization. I think it goes
11 beyond my testimony.

12 Q That's right. I agree with you. And so that is
13 not then -- that is not tested then by the examination; is
14 that correct?

15 A Only to the extent that we examine licensed
16 operators and senior reactor operators.

17 Q Taking the third stated objective, increase the
18 education, experience, and training in the operations
19 organization to substantially improve their capability to
20 perform their duties. Now, it appears in that objective
21 that education means what was accomplished in the OARP, and
22 experience is prior experience, and training means
23 on-the-job training. In reading through that, that is the
24 way those terms were developed in the -- that.

25 So consider education. Do you accept that the

1 PQS's tests were designed to measure knowledge of
2 information taught in the OARP?

3 MR. SWANSON: I think that is objectionable. That
4 certainly goes beyond the scope of his testimony. He in no
5 way characterizes the adequacy or analyzes the testing done
6 by the Licensee or any of its contractors. He is strictly
7 addressing the Contention raised by Mrs. Aamodt and the
8 NRC's requirements on how he constructs tests or requires
9 training to measure up to those requirements.

10 MRS. AAMODT: Mr. Boger stated that he did cover
11 that part of the Board Order in checking that the Licensee
12 had conducted 100-percent reexamination. So I think he
13 would have to know what tests were given and know whether
14 they were adequate.

15 CHAIRMAN SMITH: The objection is addressed to
16 although he testified to that and it may very well be the
17 case, it is not, according to Mr. Swanson, it is not part of
18 his direct testimony. And your cross examination, if
19 counsel insists, should be limited to his direct testimony.
20 If he is wrong about that, you should begin by pointing that
21 out. If you still think that the question is appropriate,
22 we will consider that on another basis.

23 MRS. AAMODT: Well, I thought that he gave his
24 testimony to answer my -- the concerns addressed in my
25 Contention. And if his testimony was inadequate in

1 answering those concerns, I feel that I have the right to
2 cross examine him.

3 CHAIRMAN SMITH: Just point out in his testimony
4 where you are cross examining. That is your solution.

5 MRS. AAMODT: Specific testimony?

6 MR. SWANSON: On page 4 he mentions that the
7 licensee has contracted with an outside firm. It really
8 does not go any further than that. He indicates that final
9 responsibility for certification of licensed operators lies
10 with the NRC.

11 She is asking about his perception of whether or
12 not this PQS test was designed a certain way with certain
13 objectives. I think -- I think that possibly raises another
14 aspect of an objection: that she is probing for knowledge
15 of Mr. Boger, I believe, about the way that test was
16 constructed, which he is not the best person to answer. We
17 have Mr. Kelly.

18 CHAIRMAN SMITH: The ruling cannot be based on who
19 is the best person to answer. It is whether it is
20 reasonably within the scope of his direct testimony. And to
21 me, it is a judgment call, you know. I mean someplace along
22 the line, certainly along that line, it would be too hard.
23 Yet I do not know exactly where that should be called.

24 MR. SWANSON: I think he can probably answer that
25 question. What I am concerned with is that she is going to

1 get into an in-depth analysis of the adequacy of the tests,
2 his perceptions of it, when that really is not what he knows
3 about.

4 MRS. AAMODT: No, I was not planning that. I want
5 to find out if it is an adequate test or an inadequate
6 test. That's all I want to know.

7 CHAIRMAN SMITH: Let's allow her to follow her
8 cross-examination plan for a while before the problem is
9 addressed.

10 MRS. AAMODT: All right.

11 CHAIRMAN SMITH: Do you recall the question?

12 THE WITNESS: No, sir.

13 BY MRS. AAMODT: (Resuming)

14 Q The PQS tests that were designed to measure
15 knowledge of information taught in the OARP, have you seen
16 them?

17 A The PQS exam?

18 Q Yes.

19 A Yes, I have.

20 Q Yes. They were modeled after the revised NRC
21 exams; is that correct?

22 A Apparently.

23 Q They are --

24 CHAIRMAN SMITH: You know that from listening to
25 Mr. Kelly's testimony?

1 THE WITNESS: I read Mr. Kelly's testimony.

2 BY MRS. AAMODT: (Resuming)

3 Q Now, are there 30 candidates presently for
4 licensing from TMI-1; is that correct?

5 A I do not know.

6 Q They have not made application with you?

7 A I do not believe so. They may have. We may not
8 have a final number of people. I just do not know how many
9 people we are going to examine.

10 Q Well, you read Mr. Kelly's testimony, and in Mr.
11 Kelly's testimony, as I understand it, there were originally
12 31 candidates and one dropped out. So I am taking that we
13 have 30 now candidates. Is that reasonable, do you think?

14 A That is the number of people that he examined.

15 CHAIRMAN SMITH: It is not going to be very
16 profitable to examine him on his understanding of Mr.
17 Kelly's testimony. The Board and the parties have much more
18 reliable basis just to take his testimony as it was.

19 MRS. AAMODT: I was examining him on this because
20 the requirement is that they pass these tests prior to his
21 testing them.

22 CHAIRMAN SMITH: Yes, but --

23 MRS. AAMODT: And I am concerned that -- and he
24 also said that he is to -- he is to decide whether the
25 Licensee has conducted a 100-percent reexamination of all

1 the operators in those areas. And so I am trying to decide,
2 you know, what he feels about the results of these tests so
3 far.

4 CHAIRMAN SMITH: The objection is, however, that
5 you have gone beyond the direct testimony.

6 MRS. AAMODT: Mr. Smith, I wanted to say, too,
7 that both Kelly figures, when I look them over, are very
8 startling.

9 CHAIRMAN SMITH: That may very well be, Mrs.
10 Aamodt, but we are taking it one witness at a time, one
11 subject matter at a time. Otherwise, we will just have
12 confusion and chaos.

13 Now, if you can point to where that subject matter
14 is covered in his direct testimony, no problem. If you
15 cannot, then you can bring -- ask leave of the Board to go
16 into it anyway. But that necessarily will be limited.

17 MRS. AAMODT: It says how will the NRC verify that
18 licensed operator training is adequate. And Mr. Boger --

19 CHAIRMAN SMITH: This is in his direct testimony?

20 MRS. AAMODT: Yes. Question Number 5. And Mr.
21 Boger said that the examination, the NRC examination, does
22 not cover any predictive elements of whether training is
23 enough and you have to look at the entire scope. He brought
24 up that you have to look at the training they got in the
25 OARP and other factors.

1 CHAIRMAN SMITH: Is that correct? Is that what
2 you testified to

3 THE WITNESS: I am not sure what she said now.

4 CHAIRMAN SMITH: Well --

5 BY MRS. AAMODT: (Resuming)

6 Q That you mentioned that in order to -- you said,
7 Question 5, how will the NRC verify that licensed operator
8 training is adequate, and you answered that -- when I
9 questioned you on the test as to whether that was predictive
10 -- that the test was not predictive but that you had to look
11 at many other things, like the OARP training and -- and that
12 you would be looking at that.

13 And I -- so I am asking you now to look at the
14 evaluation of the OARP program, which I consider these tests
15 possibly to have been.

16 A I am not sure that I testified, in my answer to 5,
17 that that had anything to do with my review of the OARP.

18 CHAIRMAN SMITH: You depend upon the OARP program
19 and the Licensee's testing, pretesting, I mean the testing
20 before you test. You depend upon that as one of the factors
21 referred to in Question 5, and that is: How will NRC verify
22 that licensed operator training is adequate?

23 THE WITNESS: No, that was not the intent of
24 that. We will make sure that everyone passed the qualifying
25 exam.

1 CHAIRMAN SMITH: Which qualifying exam?

2 THE WITNESS: The one in Order Item I.E.

3 CHAIRMAN SMITH: Okay. And you do not understand
4 that to be -- that is different from the OARP?

5 THE WITNESS: I believe --

6 CHAIRMAN SMITH: That was a separate testing on
7 LOCA and the TMI-2 accident?

8 THE WITNESS: I believe it was a separate category
9 on the exam.

10 MRS. ARMODT: So you -- I understand, Mr. Smith,
11 that he has to look at that prior to giving his NRC exams,
12 so it seems to me in his area.

13 CHAIRMAN SMITH: As I understand his answer, it is
14 that the NRC will verify that licensed operator training is
15 adequate by its own testing. And then he said, in addition
16 to that they will comply with Order Item I.E, and that is
17 that Licensee has reexamined them on the TMI-2 accident, by
18 actually looking at the Licensee's examination on that
19 subject matter, which he said was a portion of the OARP.

20 Was that your answer?

21 THE WITNESS: Right.

22 CHAIRMAN SMITH: So in that respect, I think you
23 can properly examine him on that portion of the OARP to
24 which he is responsible and which he is referring in his
25 direct examination.

1 MRS. AAMODT: The part that troubles me about the
2 report we got on Friday about these tests is that I
3 understand now that a number of instructors took that test,
4 and that data does not appear to me was broken out from the
5 students who took the test or candidates for the control
6 room positions who took the tests. And in that case, the
7 data that was given is -- is inaccurate in reflecting how
8 well the personnel who will be operating the control room
9 did on the test.

10 BY MRS. AAMODT: (Resuming)

11 Q Now, do you -- have you looked at that, Mr.
12 Boger? I understand that there were 30 candidates but that
13 a number of those candidates were instructors; is that
14 correct?

15 A They may well have been instructors. I do not
16 know.

17 Q The instructors have been required to take their
18 licensing -- to fill an order -- to fulfill -- I do not know
19 what you call it, whether it is an order in NUREG-0660 -- is
20 that an order, Mr. Smith?

21 CHAIRMAN SMITH: No, it is nothing. It is a
22 report to the Commission on action plan developed as a
23 result of TMI-2 accident, and it has been -- in many
24 different subject matters -- it has been superseded by later
25 documents. But, however, the Commission, I think, did

1 approve in general the objectives of that NUREG. So it is
2 not an order. However, it does have something of greater
3 force than just someone's opinion.

4 MRS. AAMODT: Yes.

5 CHAIRMAN SMITH: However, we still are limited to
6 the scope of this proceeding.

7 MRS. AAMODT: Yes. Yes. But I am trying to find
8 out then how well the operators did without the instructors'
9 scores in this test on the Lessons Learned.

10 BY MRS. AAMODT: (Resuming)

11 Q And you do not know what?

12 A I do not.

13 CHAIRMAN SMITH: All right. Let's put the
14 question more directly to Mr. Boger. In Question 5 and in
15 other testimony you say that one thing you are going to do
16 is you are going to administer NRC's tests, and I still
17 think that the testimony is rather vague there, that Mrs.
18 Aamodt was left hanging with an answer where you said it was
19 not predictive. However, I do not think that you made it
20 clear that the test -- that you are confident that the NRC's
21 test will be an adequate measure of the operator's
22 competency. I do not know if you have ever made that
23 particularly clear, but I think you should.

24 Then you should also address generally what
25 factors other than the NRC's testing you will rely upon to

1 determine that the objectives of Order Item I.E have been
2 met. And to the extent that the small-break LOCA and TMI-2
3 accident portion of the OARP program is relied upon by you,
4 you should, in a narrative fashion, tell what your views of
5 that reliability is.

6 And then after you get that out then, maybe
7 particular questions and answers might be helpful. But the
8 difficulty is here you are trying to construct -- you are --
9 you are taking straws and trying to construct a haystack
10 before you know what the haystack looks like, except I guess
11 you do not make a haystack out of straw.

12 MRS. AAMODT: Right.

13 (Laughter.)

14 CHAIRMAN SMITH: So let's look generally at how he
15 goes about it, and then see if your particular questions
16 have more meaning.

17 All right, now, do you believe that the NRC test
18 will measure the competency of the operators to operate the
19 plant?

20 THE WITNESS: Yes.

21 CHAIRMAN SMITH: Okay. Now, are there other
22 factors that the NRC will use to verify that licensed
23 operator training is adequate?

24 THE WITNESS: Yes, there are.

25 CHAIRMAN SMITH: What are those factors?

1 THE WITNESS: The Licensee and all Licensees will
2 require to provide their operators with additional
3 training. We would review the records to make sure that
4 that training had been provided.

5 CHAIRMAN SMITH: And do you review the records to
6 determine whether that training is adequate, or do you
7 accept the Licensee's report that they have accomplished
8 that retraining?

9 THE WITNESS: I think, in this case, I can say
10 that I have reviewed some of the material that was provided,
11 and found it adequate.

12 CHAIRMAN SMITH: All right. What material have
13 you reviewed?

14 THE WITNESS: The OARP.

15 CHAIRMAN SMITH: All of it, or just the part
16 relating to Order Item I.E?

17 THE WITNESS: Specifically, those requirements of
18 Order Item I.E. Beyond that, selected lesson plans.

19 CHAIRMAN SMITH: Okay. Now, can you address Mrs.
20 Aamodt's concerns about the instructors being, in her view,
21 of questionable capability?

22 THE WITNESS: An instructor has to pass the same
23 exam as an operator does. So, from my point of view, he
24 gets the same exam. There is no difference.

25 BY MRS. AAMODT: (Resuming)

1 Q The thing that is troubling me is our addressing
2 the adequacy of the OAPP in covering these subjects. We are
3 using the test scores and the test was designed to meet your
4 requirements by Mr. Kelly. And on this test there were,
5 according to your requirements, half failed. Of the half
6 that passed, how many were instructors and had nothing to do
7 with -- will not be in the control room? So that actually
8 where it looks like a 50-percent failure, it may indeed be a
9 75-percent failure or more. And that, to me, would seem
10 very serious.

11 A I do not know what percentage of the passes or
12 failures were instructors.

13 Q There -- I counted that there were, I think, 9
14 instructors who did not have their SRO licenses in the TMI
15 staff. If that 9 was taken out of the 15, that leaves only
16 6 who passed out of 21.

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1 CHAIRMAN SMITH: These questions should have been
2 put to the panel.

3 MS. AAMODT: Yes, yes. I did not realize that
4 until I read in detail this 0660, that this had been
5 required, and then I looked back and I saw, oh, indeed, I
6 really seriously feel that there was withholding of
7 information by Mr. Kelly in this proceeding in that there
8 was an attempt to give us figures that were not accurate in
9 reflecting what we want to know about the control room
10 personnel.

11 MR. SWANSON: Mr. Chairman, I am not sure of the
12 relevancy of this particular line of questioning since the
13 requirement is that those who failed are eventually going to
14 have to achieve a 90 percent grade on that.

15 CHAIRMAN SMITH: Not only that, but the breadth of
16 the question goes beyond the relevancy of the portion of the
17 test which relates to the accident and to the LOCA. The
18 only thing we can say is we will allow a limited amount of
19 inquiry of this witness on what he knows about it, and
20 particularly as to the portion with the small break LOCA and
21 the TMI 2 accident. So if he does not know, you will just
22 have to take that as a record for you to cite.

23 MS. AAMODT: Yes. Well, I assume now that he does
24 not know. I have asked these questions and he does not seem
25 to know. So --

1 CHAIRMAN SMITH: That is not my understanding of
2 it.

3 MS. AAMODT: Oh.

4 CHAIRMAN SMITH: There is one question he did not
5 know, and that is the mixture of instructors. I do not know
6 if he knows anything else about it or not.

7 BY MS. AAMODT: (Resuming)

8 Q Do you know what the -- well, the average score
9 has the instructors mixed in so it is a meaningless figure
10 as far as what the control room personnel are doing.

11 CHAIRMAN SMITH: As he said, he does not know.

12 MS. AAMODT: Mr. Kelly is not here to resolve it.
13 I don't know whether Dr. Long would have those figures.

14 CHAIRMAN SMITH: I just wonder if the transcript
15 really bears out your interpretation of it. I will say that
16 I do not remember, but I certainly got the impression that
17 the figures he gave me -- if that is incorrect, I do think
18 it should be explained, that the figures that he clarified
19 and the figures that were given were intended to be the
20 results of the people who are going to run the plant.

21 MS. AAMODT: So did I, so did I.

22 CHAIRMAN SMITH: If that is not the case, I think
23 by one means or another that you are entitled to an
24 explanation.

25 Can you help us on this, Mr. Long? Do you know

1 the answer?

2 MR. BLAKE: Mr. Chairman, I wonder if I might
3 check into this and report back to the Board on it. I
4 realize Dr. Long is here, and I do not know whether he can
5 help you with this. I do not know this particular subject
6 area. I will get back to the Board on it. I don't know the
7 answer at the moment.

8 CHAIRMAN SMITH: It certainly is true that the
9 digression on this point with this witness is not going to
10 be productive.

11 MS. AAMODT: No, it is not going to be productive,
12 so I cannot ask Question 21 then. I would like to ask
13 Question 22, though, to point out the inadequacy.

14 BY MS. AAMODT: (Resuming)

15 Q Are you satisfied that these candidates are ready
16 to take the new licensing exams? Has anything so far
17 satisfied you as far as their education goes?

18 A When the applications are submitted, they will be
19 evaluated against our standards.

20 Q I asked you a different question. Are you
21 satisfied this morning?

22 A I have not seen their applications.

23 Q You --

24 A When they submit them, we will look at the
25 application and make sure they meet our regulations.

1 Q So you have no opinion as of this morning as to
2 whether the candidates, the control room personnel presently
3 -- the control room personnel at TMI 1 are adequate to stand
4 examination by --

5 A I have not reviewed their -- I do not know who
6 took the exam. I cannot address that.

7 Q Why are we trying to restart the reactor?

8 CHAIRMAN SMITH: You have raised a point that I
9 think does deserve some comment. The hearing, of course,
10 has lasted a long time and is going to last a long time. We
11 cannot start for the first time the hearing, after
12 everything has been accomplished. The order would, in this
13 case, I imagine, among other things permit the Board to find
14 that Order Item. I.E. is indeed a necessary item in the short
15 term to protect the health and safety of the public. We
16 would not necessarily have to find that Order Item. I.E. has
17 been achieved at the time we render our initial decision.
18 We could find Order Item. I.E. must be --

19 (Board conferring.)

20 CHAIRMAN SMITH: You see, we do not have to find
21 that a short term item has been accomplished before
22 restart. The order makes it clear that the Board can say
23 what must be done, but the Director of NRR may certify that
24 that has been done.

25 Now, we can ask and inquire in advance as to the

1 means by which he will satisfy himself, the Director of NRR,
2 but we find throughout this entire long proceeding that you
3 do not do all these things and then start the hearing. The
4 hearing was ordered to begin immediately.

5 MS. AAMODT: I understand.

6 CHAIRMAN SMITH: So we do not necessarily say that
7 because -- that Mr. Boger has not satisfied himself that
8 these exam candidates are prepared to take the exam, we do
9 not necessarily arrive at the conclusion that the staff or
10 the Licensee is in default as of today.

11 MS. AAMODT: Well, the only reason I bring that up
12 is that the OARP has been completed. If we were beginning
13 the OARP, then I feel we would be in that circumstance. We
14 have completed the OARP and here is where we are with this
15 large number not meeting the requirements of the NRC, and it
16 troubles me in that I would not like to see the plant
17 operated by six people who passed the exam.

18 CHAIRMAN SMITH: You might urge a finding that the
19 Board rule that the results of the OARP are not an adequate
20 basis for the staff to determine that the candidates are
21 ready. You might urge a finding. They may come back and
22 say well, after all, the testimony was that there was going
23 to be another exam.

24 I believe that was the testimony, that there was
25 going to be another exam administered, and I do not know. I

1 mean, it just -- everything is not so concrete as you would
2 like it to be, and I understand why you would like it to be
3 that way, but it just does not work that way.

4 MS. AAMODT: It seems, though, that a major effort
5 was put forth, and that magnitude of failure with a major
6 effort as a response to it -- to a deficiency seems to me
7 very significant, and that is what is troubling me. It is
8 only that one particular scenario that we are talking about,
9 and my question --

10 CHAIRMAN SMITH: The magnitude of the failure on
11 the OARP tests --

12 MS. AAMODT: Yes, the magnitude of failure on the
13 test. This is one scenario -- the question comes to my
14 mind, why cannot a group of men learn everything that there
15 is to know about one scenario, and if they cannot, what
16 assurance do I have that they can know about all the other
17 ones that are not as adequately covered or not covered at
18 all?

19 CHAIRMAN SMITH: I mean, I understand your
20 concerns, and you have made it clear, you know, what your
21 position is and the other party has made his position clear,
22 too, and there comes a time when, after you have developed a
23 full record, the record cannot -- see, we do not sit here
24 and decide.

25 MS. AAMODT: Mr. Smith -- yes.

1 CHAIRMAN SMITH: At the end of each issue we have
2 to take the entire record as it is put to us. Sometimes we
3 do see an area where we believe that the record is void, but
4 not always. It may not even occur to us the record is void
5 until we get the proposed findings.

6 I do think, for example, we just interceded right
7 now and said that if -- if the impression we received that
8 the test scores were not those of the people who are going
9 to operate the plant, we wonder why such irrelevancy might
10 have been put into the testimony. We want that clarified.

11 All in all, we are just going to have to wait
12 until the case is over and the findings are submitted.

13 (Mr. and Mrs. Aamodt conferring.)

14 MS. AAMODT: Doesn't that question relate, though,
15 to the Licensee's request for an early restart, Mr. Smith?

16 CHAIRMAN SMITH: The Licensee has not requested us
17 for an early restart.

18 MS. AAMODT: All right.

19 CHAIRMAN SMITH: I mean, earlier than the notice
20 and order of hearing.

21 MS. AAMODT: Skipping down to fatigue, question
22 one, if the plant should be granted permission to restart --
23 maybe I should read this before I ask it. That was my
24 concern. How would the plant be operated, if the plant
25 should be granted permission to restart and the same

1 percentage failed the Kelly exam -- as failed the Kelly exam
2 failed the licensing exams?

3 But perhaps Mr. Joger would not answer that
4 question anyway.

5 CHAIRMAN SMITH: Well --

6 MS. AAMODT: And again, a failure --

7 CHAIRMAN SMITH: Is that a question to him?

8 BY MS. AAMODT: (Resuming)

9 Q My question to him is this, it fits into training
10 and testing. If failure -- if the operators continue to
11 fail in the same numbers as failed the Kelly exam, would the
12 kind of testing that you do reflect whether those who were
13 licensed could work the longer hours and more consecutive
14 days that would be now required of them to match this?

15 MR. SWANSON: Objection. We are now getting into
16 the operations concerns that the Board has previously ruled
17 is outside the scope of her Contention.

18 This is an indirect way to getting around to the
19 length of shift again and fatigue.

20 MS. AAMODT: Mr. --

21 CHAIRMAN SMITH: Wait a minute. I think that --
22 you are saying that because of the failures, it could be
23 predicted that there will not be enough operators passing to
24 operate the plant safely. Okay. And I do not know how the
25 Board itself would rule on it. We are also interested in

1 the number of operators available and trained under the
2 management aspect of it, the part you did not participate
3 in, and there have been representations made to us in the
4 findings which we will have to depend upon that there will
5 indeed be sufficient operators -- and we were told how many
6 there would be and how many are senior reactor operators,
7 and what they will do and what the shifts are and everything
8 else.

9 Now, if we make findings based upon that and it
10 should happen that the plant starts operating materially
11 short of that, somebody is going to be really upset about
12 it, and you would have every right to be -- and you make
13 that known, and there would be a different proceeding which
14 -- I cannot predict what would happen, but let's say --
15 let's take what your concern seems to be. Let's say that we
16 issue an order, having made findings that the management has
17 enough operators, and it turns out that they start working
18 the plant and only half of those people show up as being
19 licensed operators, it would seem to me that you or any
20 citizen would have an immediate opportunity to address the
21 Commission for a show cause order why that plant should not
22 be shut down because of that variance between their
23 assertions -- well, let's get back.

24 Your difficulty is you are trying to approach too
25 much of the hearing through one facet, one window, and that

1 is the operator training, and you are not really aware of
2 all the evidence that has happened and everything else which
3 has gone on in the case.

4 Does that answer your particular question?

5 MS. AAMODT: Well, I was -- yes, it does. I was
6 concerned. I did read, Mr. Smith, about the shortage of
7 operators in the testimony that had preceded the day I came
8 here, and I did see that, and of course that strengthened
9 this concern in looking at the failures on the examinations,
10 and I do feel that Mr. Swanson is objecting in an area that
11 I have a right to question in because fatigue -- I was
12 allowed stress, and the Board has indicated its interest in
13 knowing whether training and testing was adequate under
14 stressful conditions, and fatigue --

15 CHAIRMAN SMITH: Your question to me was what if
16 they fail and they start to try to operate the plant with
17 inadequate operators? So I answered that question.

18 Now, why don't you take up another question with
19 that in mind? Was that answer, however, to you a helpful
20 answer?

21 MS. AAMODT: Yes, it is a helpful answer, and I am
22 still concerned that even if I got that show cause order,
23 that as far as fatigue has been examined in these
24 proceedings and in the NRC's or the Licensee's work, that it
25 has not been examined in a manner that satisfies me that

1 training and testing are adequate to overcome the fatigue of
2 working 14 consecutive 12-hour shifts, which is what NRC is
3 saying is allowed. The Licensee has agreed to a much, much
4 less rigorous schedule, but they would be pushed to the NRC
5 allowable schedule, and I would have no right to come
6 against them on going to that schedule, and that is what I
7 am concerned about.

8 CHAIRMAN SMITH: How does that relate to your
9 questioning of this witness?

10 MS. AAMODT: My question of the witness was that
11 can you certify that training is adequate by your tests,
12 that the training of those that you license is adequate by
13 your tests to operate the plant under the long hours that
14 NRC would allow if they were short of manpower.

15 CHAIRMAN SMITH: Why don't you read your question
16 exactly. You wrote it very well.

17 MS. AAMODT: Did I? Okay.

18 CHAIRMAN SMITH: Yes.

19 MS. AAMODT: Which one?

20 CHAIRMAN SMITH: No. 3 under Fatigue.

21 BY MS. AAMODT: (Resuming)

22 Q How sure are you that the capabilities you have
23 measured on your licensing exams are as measure^d after 14
24 consecutive days on 12-hour shifts as approved by the
25 Commission.

1 A I do not think you could compare the two by my
2 tests.

3 MR. SWANSON: If I could make a clarification, the
4 question almost sounded as though that would be allowed on a
5 routine basis, the 12-hour shifts, and that is not what you
6 meant to imply, was it?

7 MS. AAMODT: I am meaning that that could be a
8 situation, if the Kelly tests indicate -- are foreseeing
9 what might happen on the licensing exams. If that is true,
10 I am asking how sure are you that the capabilities that you
11 have measured and licensed are as measured after 14 days.

12 MR. SWANSON: Okay. My concern was that I think
13 that carries the insinuation that that is going to be
14 allowed on a routine basis. 0694, I believe, uses the
15 terminology "under unusual circumstances" can they go on
16 that length of shift.

17 I might just point out that length of shift, etc.
18 was discussed in the SER supplement at page 11, and of
19 course the people who sponsored that portion were here at
20 the beginning of last week. They will be able to answer
21 questions in that area.

22 CHAIRMAN SMITH: Within the context of how it is
23 used in the SER.

24 Is that how you meant to ask the question? I
25 suppose you must. Otherwise there is no basis for your

1 question.

2 MS. AAMODT: It is the February 1, 1980, and then
3 I believe July, there was another one in July 1960 that
4 reiterated about the same kind of schedule. It just says
5 that it should be limited to the following maximum work
6 hours.

7 CHAIRMAN SMITH: Okay.

8 MS. AAMODT: Should not be permitted to work more
9 than 12 hours, but it does not say that that is something
10 that cannot be used as a work schedule.

11 CHAIRMAN SMITH: There are circumstances where
12 that would be permitted. Whatever those circumstances are,
13 to what extent does your test measure those capabilities,
14 and he has answered that, haven't you?

15 THE WITNESS: I think I did.

16 CHAIRMAN SMITH: Yes.

17 What was your answer?

18 THE WITNESS: That our test is not used to predict
19 that.

20 CHAIRMAN SMITH: All right.

21 MS. AAMODT: Is not used to predict that.

22 CHAIRMAN SMITH: Yes.

23 MS. AAMODT: Thank you.

24 BY MS. AAMODT: (Resuming)

25 Q You have no other test, I suppose, that is used to

1 predict -- NRC has no other testing that is used to predict
2 that. This SER report or other reports on fatigue, are any
3 of them based, as far as you know, on testing?

4 A I do not know how the conclusions were reached in
5 that part of the SER, so I cannot answer your question.

6 (Board conferring.)

7 BY MS. AAMODT: (Resuming)

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1 (Board conferring.)

2 Q I am not sure where it is in your testimony. I
3 did not fill it in. But it is one of the pages here you
4 mentioned that different -- here they are --

5 CHAIRMAN SMITH: Excuse me. Before you go in, Dr.
6 Little has a question. Is there any part of your testing
7 process that is intended to measure or to assure the
8 Commission that operators can perform under fatiguing
9 circumstances?

10 THE WITNESS: Other than the length of the exam or
11 the conduct of the oral exam, no.

12 BY MRS. AAMODT: (Resuming)

13 Q Mr. Boger, you mention on page 5 of your testimony
14 that different forms of the test are given to different
15 candidates so that there is no overlapping -- so that there
16 is overlapping of knowledge through staffing of the control
17 room of a large number of problems and information that can
18 be drawn upon to construct the tests. How many are covered
19 in the four different examinations given to the licensed
20 personnel of a single crew?

21 A Where did you get the four examinations?

22 Q Aren't there four licensed -- licensed operators
23 in each crew or shift?

24 A Yes, there are.

25 Q So they would have been given four different forms

1 of the tests, testing different information on those
2 categories we talked about earlier.

3 A Not necessarily. They would all be -- they might
4 all receive the same written exam. It is possible for that
5 to happen. They would each get an individual oral
6 examination.

7 Q So you say here that you are even then taking away
8 the answer that you gave me here. You say here that, "While
9 each operating test must cover a minimum number of plant
10 systems operating procedures and transients, that the
11 specific topics will not be the same for each applicant. If
12 the exam indicates that there is a subject or system which
13 has not been adequately covered in the training program, we
14 will inform the facility management to provide additional
15 training in the weak area."

16 Now, I thought there was a composite look at a
17 crew to see whether they as a crew had -- had had adequate
18 training. Is that -- have I assumed something?

19 A I believe you have.

20 Q So you do not look, then, at the composite
21 knowledge of the crew and use the test to give you some
22 indication of that?

23 A No, we do not.

24 Q You said you did here. You say right after
25 three: "The operating test varies from one individual to

1 another so that we can assess the overall effectiveness and
2 scope of the training program."

3 A That is right.

4 Q But you say it ain't necessarily so, though.

5 A The oral exam which we are talking about here, the
6 operating test varies from individual to individual.

7 Q Oh, I see. Okay. The operating test. I see. I
8 am assuming that also has to do with the written test. The
9 operating test does that, but not your written test; is that
10 right?

11 A The written test may or may not vary from
12 individual to individual.

13 Q All right. Then the operating test is not very
14 structured, though; isn't that true? There are no forms or
15 that sort of thing; are there? Are there?

16 A Yes, there are forms.

17 Q There are forms?

18 A Yes.

19 Q So maybe then I -- I misread that. And was Mr.
20 Kelly given copies of any of the tests that you plan to use
21 in the licensing exams?

22 A Not by me.

23 CHAIRMAN SMITH: Do you know whether he was given
24 any by anybody?

25 THE WITNESS: Not by the NRC.

1 MRS. AAMODT: How --

2 DR. JORDAN: Didn't Mr. Kelly have copies of all
3 the exams that had been used by the NRC?

4 THE WITNESS: Those exist and are out in the
5 world. What happens is an individual may request his exam;
6 We will provide that individual a copy of his exam. What he
7 did with the exam after that was up to him. So, you know,
8 our exams are available through that process.

9 BY MRS. AAMODT: (Resuming)

10 Q Including the new portion on the TMI-2 accident
11 events and LOCAs?

12 A Yes, that would be available through the same
13 process.

14 Q Yes.

15 CHAIRMAN SMITH: I was concerned about your
16 seemingly qualified answer. First you said Mr. Kelly was
17 not given copies of any of the tests you planned to use by
18 you, and then you said, "Well, not by the NRC." But do you
19 have any reason to believe that anybody has gained access to
20 the tests that you plan to administer?

21 THE WITNESS: The test has not been written yet.

22 CHAIRMAN SMITH: Okay, so it could not be --

23 THE WITNESS: We are talking about exams that have
24 already been administered at other facilities.

25 BY MRS. AAMODT: (Resuming)

1 Q Well, Mr. Kelly seemed to indicate in his cross
2 questioning that his tests contain similar questions to
3 those on your test. In fact, some probably would be the
4 same. Did you hear that?

5 A I may have. I do not recall the specifics. It
6 would not surprise me, though.

7 CHAIRMAN SMITH: Yes.

8 BY MRS. AAMODT: (Resuming)

9 Q It would not surprise you?

10 A No.

11 Q With all the complicated things that there are to
12 know about a nuclear plant, are there -- is there a closed
13 set -- is there simply a small number of items that occur on
14 these exams, so that coaching on them somewhat invalidates
15 them?

16 A Some principles of reactor operation are required
17 of everyone. Everyone has to know those aspects. And as
18 such, the questions overlap in those areas.

19 Q Do you consider that a serious problem, the
20 coaching effect?

21 A No.

22 (Pause.)

23 Q To go back to what I really meant in Question 1 to
24 the written exams, I am trying to determine the reliability
25 of your tests. Are they so much the same that you just know

1 from -- just know intuitively that they are -- the tests you
2 give the one person is the same test that you are giving to
3 another person? In testing terms, that is called
4 reliability. Are you -- so that if I -- if X -- if Mr.
5 Jones should fail a test and Mr. Smith should pass the test,
6 Mr. Jones couldn't say to Mr. Smith, "Well, I did not get
7 the same test. The test I had was much harder. What did
8 they ask you about so-and-so?"

9 Are the tests reliable in that regard? Have you
10 -- that is a basic -- a basic testing measure, a measure of
11 a test. You examine a test initially for reliability.
12 Maybe you don't know what you're testing, but you at least
13 want to always test it with the same yardstick or measure it
14 with the same yardstick. Have you looked at your tests,
15 your written tests from that viewpoint?

16 A If you are speaking of repeatability of different
17 exams, yes, we consciously try to make the exams
18 equivalent.

19 Q Yes. But not in any quantitative or not -- not in
20 terms maybe -- maybe we would look afterwards and see that
21 they were reliable, but you do not look ahead of time, is
22 that true, and see if they are reliable?

23 A Reliable or repeatable?

24 Q What is that?

25 A Reliable or repeatable?

1 Q In my terminology, reliable. But maybe you are
2 calling it repeatable. The test is reliable if it is
3 measuring the same thing every time. All its different
4 forms. If today, if I took the test today, I would get a 90
5 on it, and if I took another form of the test tomorrow I
6 might get a 92, and if I took another form of the test three
7 days later I might get an 89. But I am centering about a
8 90, see. So then we would say those ones were reliable.

9 Is your test subject to that kind of scrutiny,
10 your different forms of your tests?

11 A In the way we construct the tests, we would expect
12 to find results that you suggest, that the same operator
13 would receive an equivalent score on another exam.

14 Q Yes. So -- but you are saying that the written
15 tests you give are the same for all four people on a crew;
16 is that right?

17 A I said they might receive the same exam, the same
18 written exam.

19 Q Yes. You -- you did not -- what would you feel
20 about having a program where you -- you devised reliable --
21 tests that were essentially the same measures and then gave
22 different tests to each person? Wouldn't this increase the
23 insurance of the amount of knowledge that a crew had, since
24 you are concerned about overlapping knowledge?

25 A I do not know.

1 DR. LITTLE: Could I interrupt for just a quick
2 question here? Are these tests intended to be comprehensive
3 examinations of a body of knowledge, or are they intended to
4 be sampling tests to test whether an operator knows the
5 field pretty well?

6 THE WITNESS: They are more along the lines of an
7 audit-type exam.

8 (Board conferring.)

9 MRS. AAMODT: I did not hear the end of your
10 question, Dr. Little.

11 DR. LITTLE: He said they were more an audit-type
12 of exam rather than a comprehensive exam of a body of
13 knowledge. In other words, you can give a pop test and ask
14 for questions and tell whether someone is generally prepared
15 versus a comprehensive examination which would test every
16 important part of --

17 MRS. AAMODT: These are more like the audit tests,
18 he said?

19 DR. LITTLE: Yes.

20 THE WITNESS: I did not compare them to a pop
21 exam, though.

22 DR. LITTLE: No, they are not exactly pops.

23 BY MRS. AAMODT: (Resuming)

24 Q So they are not then -- they are not a
25 professional -- they are not comparable then to the kinds of

1 professional examinations that would be given, for instance,
2 to engineers or doctors or lawyers and that sort of thing?

3 A There were questions on my SRO exam that I took
4 that were more comprehensive than the examination I took for
5 a professional engineer's license.

6 Q I am not asking about the level. I am asking
7 about the format of the exam. Dr. Little, in answer to her
8 question, you said it was more an audit exam. My feeling is
9 that with an audit exam you should be applying more testing
10 techniques for determining reliability and validity than you
11 would with a professional type examination.

12 What is your impression on that?

13 CHAIRMAN SMITH: His answer was -- his answer was
14 that he felt that the testing was more comprehensive than
15 his professional exam. He is not agreeing with your premise
16 that the professional exams are not audit type. Nor would
17 I. I cannot imagine a four-day bar examination test which
18 tests your total comprehension of the profession, nor can I
19 imagine a nine-hour operator test which will test his total
20 comprehension of what he has to know. I guess I have a bias
21 that I better explain about your viewpoint.

22 Having taken a lawyer's exam, I know the four days
23 I took it does not begin to test. It is an audit test.

24 MRS. AAMODT: I understand that, too. But
25 certainly a four-day test would test more than a one-day

1 test.

2 CHAIRMAN SMITH: The thread of some of your
3 questions you say, "Would not this improve, would not that
4 improve, would not something else improve," which has an
5 unspoken implication that improvement is required.

6 MRS. AAMODT: Yes. I am sorry.

7 BY MRS. AAMODT: (Resuming)

8 Q Well, what I am trying to -- trying to sort out in
9 my mind is that you have a test which does not include
10 everything, that has not been subjected to the rigors of
11 test construction, that would certify its validity or its
12 reliability.

13 Now, is that a true or untrue statement?

14 A We do not have a formal program. I think, as we
15 discussed this morning, there are aspects of test
16 construction or test validation that we do consider when we
17 make up the exams, and it is just not a formal program.

18 Q I just have to leave that there. That is a matter
19 of judgment.

20 On stress, you responded in your testimony, pages
21 4 and 5 -- 5 and 6, I am sorry -- regarding stress and how
22 it might affect control room performance.

23 (Pause.)

24 You say that the stress of the examination must be
25 overcome. Weren't you talking about stress as a fitness

1 requirement, that this individual has to be able to handle
2 the stress of the examination in order to pass it and
3 therefore he can handle stress. Is that what you were
4 saying?

5 A I am not sure --

6 CHAIRMAN SMITH: As compared to?

7 BY MRS. AAMODT: (Resuming)

8 Q As compared to the kinds of stress that you would
9 find in an emergency situation which would incorporate not
10 only the internal stresses but the other -- the external or
11 environmental stresses?

12 A No, I did not compare the two.

13 CHAIRMAN SMITH: Did I destroy your question?

14 MRS. AAMODT: My line of questioning --

15 CHAIRMAN SMITH: I mean is that what you were
16 trying to achieve by your question?

17 MRS. AAMODT: Yes, yes, I was.

18 BY MRS. AAMODT: (Resuming)

19 Q I am trying to say, then, is there much -- is
20 there any comparison of the stress of the test and the
21 stress of an emergency situation? For instance, was the
22 testing room quiet?

23 A I assume it will be relatively quiet, yes.

24 Q Did the test candidate have to take or make any
25 telephone calls while he was solving his test problems?

- 1 A No.
- 2 Q Were there telephones ringing?
- 3 A Probably not.
- 4 Q How many other sounds were audible other than
5 background noise?
- 6 A That depends on the examining room.
- 7 Q And was the problem on the test one with which he
8 had some familiarity?
- 9 A Let me back up. Are we talking about the written
10 test now or the operating test?
- 11 Q Either.
- 12 A Then I would like to go back and change some of my
13 answers.
- 14 Q Well, why don't we take the written test first.
15 Why don't we say that first.
- 16 A Okay.
- 17 CHAIRMAN SMITH: The written examination?
- 18 BY MRS. AAMODT: (Resuming)
- 19 Q The written examination.
- 20 A Okay.
- 21 Q Are all of these things not present in the written
22 examination while the person is taking that which would be
23 present in an emergency situation, background noise, the
24 telephone, telephone calls, and so forth?
- 25 A The written exam is conducted in a fairly calm

1 environment, which I would not expect in an emergency
2 situation.

3 Q Yes. How about the operating test?

4 A The operating test is conducted in the control
5 room, for the most part, where it is subjected to the normal
6 background noise in the control room, telephones ringing,
7 people coming into the room, directions being given, alarms
8 coming on. It is conducted in that environment.

9 Q There are no demands put on the operator to answer
10 telephone calls or do other -- make -- communicate or do
11 things other than answering your questions; is there?

12 A That is correct.

13 (Mr. and Mrs. Aamodt conferring.)

14 Q Were there any impacts of an emergency nature
15 other than those of the ordinary operating nature, as he is
16 taking this operating -- operating test?

17 A You are speaking of external stimuli?

18 Q Yes.

19 A No.

20 Q Do you have any test of the capability of the
21 candidates to solve the problems of multiple-event failures
22 in such a typical emergency environment?

23 A Well, we cannot simulate the emergency environment
24 during the exam, so I would have to say we could not
25 evaluate it in that manner.

1 Q You could on a simulator; couldn't you?

2 A Certainly.

3 Q On the oral --

4 CHAIRMAN SMITH: Would you concede in your
5 questioning that which I did not understand your position to
6 be last week, that the simulator does duplicate the stress
7 of an actual emergency situation in a control room?

8 MRS. AAMODT: Well, I think it could be used to
9 simulate the external stresses, but I do not think you could
10 ever simulate the internal stresses. You could never --

11 CHAIRMAN SMITH: You could not simulate the stress
12 occasioned by the actual awareness of --

13 MRS. AAMODT: "That we may be in a bad situation
14 and it may be my fault," you know, if I do not solve this,
15 and all the kinds of internal things that people do to
16 themselves. But you certainly could simulate the external
17 stresses, but they hadn't, as I understood, done that.

18 CHAIRMAN SMITH: Yes.

19 BY MRS. AAMODT:

20 Q On the oral examination, will the test be
21 administered after changes to the control room have been
22 made? Well, I see it is 30 days, is that right, prior to
23 the -- you changed that testimony this morning to say that
24 30 days prior to restart that you would administer the
25 operating exam. Is that correct?

1 A That is correct.

2 Q Yes. Will the -- will the operating test be
3 administered at that time if all changes have not been made
4 to the control room?

5 A The exam will be given based on the control room
6 arrangement at the time of the exam.

7 Q So your -- the assumption is that the control room
8 will be as it will finally be in operation when you
9 administer the exam?

10 A We expect it to be in almost final form by then.

11 Q Will any allowances be made in testing for
12 unfamiliarity with those changes?

13 A In the cases where we know equipment is going to
14 be installed and we know where its location will be on the
15 control board, we would expect the operator to have
16 knowledge of that instrument or control if it was indeed
17 going to be in place prior to startup.

18 Q So you will -- will you hold them to the same
19 standards that -- as you would have held them to if no
20 changes had been made, of familiarity with the controls or
21 confidence with the controls?

22 A We may be talking two different things. We are
23 talking about an as-designed control room that exists at the
24 time of the exam as opposed to one that may be modified
25 within 30 days of that exam. And we would hold them

1 responsible for the equipment that would be installed in
2 that 30-day time period.

3 Q I am just asking, since there will be changes, and
4 Dr. Christensen spoke about making so many changes that the
5 control room operators' performance would be jeopardized.
6 Are you taking that into consideration? Will you be testing
7 in the same -- to the same standards of familiarity with --
8 with the control room that would have been prior to --

9 MR. BLAKE: Objection.

10 BY MRS. AAMODT: (Resuming)

11 Q -- to those changes?

12 MR. BLAKE: The basis for my objection is the
13 premise -- one of the premises in the question which cites
14 Dr. Christensen for the proposition that there will be so
15 many changes that it could be -- put the operators in
16 jeopardy. I do not recall that portion of Dr. Christensen's
17 testimony.

18 In fact, my recollection is that he said precisely
19 the opposite. He might not have said it while Mrs. Aamodt
20 was here, but he said it on January 15, when the subject was
21 covered in greater detail in human factors, one of the basic
22 -- human-factors people must take in in upgrading the
23 familiarity with the equipment and the need to train people
24 with any modifications that are made.

25 MRS. AAMODT: You make my point, Mr. Blake.

1 MR. BLAKE: Thank you. Is the question now
2 withdrawn then?

3 MRS. AAMODT: No. I think you made my point, that
4 you said -- by saying that that was a consideration they
5 had. Human engineering is not a precise science, nor has
6 the way it has been applied in this hearing precise. Mr.
7 Christensen spent 100 hours only in that area. So here we
8 have changes being made. How do we know -- we may have made
9 so many that we have -- we have now infringed on the
10 competency of the operators in handling the controls.

11 I am asking will that be taken into account in
12 giving these examinations? How standardized, maybe I should
13 ask, will these examinations be, how rigidly applied?

14 DR. LITTLE: I think there are two things going
15 here. First of all, in the training there have to be
16 allowances for all of the different changes to make sure
17 that the operators are familiar with them. And the
18 question, as I understood it originally, is: Are you going
19 to expect the operators to perform as well on these new
20 controls as they would have -- as you would expect them to
21 perform on the old controls? You are not going to give them
22 allowances for working with new controls; you are going to
23 expect them to be just as adept as if they had been working
24 with those controls for 10 years.

25 THE WITNESS: Yes.

1 DR. LITTLE: I think that is where we were going.

2 BY MRS. AAMODT: (Resuming)

3 Q Now, you use a standardized form; is that right?

4 A No. I believe I said we have a form that we use
5 to fill out.

6 Q Do you, as you -- the operating test as it is
7 administered is the form filled out, or afterwards?

8 A I personally fill out parts of the form prior to
9 the exam, so I will know what systems or what transients I
10 am going to cover before I ever start the examination.

11 Q As you are progressing through the examination, do
12 you use a form to fill out what response, whether it was
13 satisfactory or unsatisfactory, at every point in the exam?

14 A It is the same form.

15 Q What is that?

16 A It is the same form.

17 Q Well, you are not answering my question. Do you
18 -- do you -- do you impose on yourself in grading this exam
19 the -- a form whereby every step of the examination it is
20 either pass or fail?

21 A It is not as clear-cut as that.

22 Q So you essentially -- this is not standardized?
23 Your oral test is not what we would call standardized?

24 A Standardized from the point that I am required to
25 cover X number of systems, X number of transients, so many

1 instruments, radiological controls. I am required to cover
2 certain areas. The systems that I choose or the transients
3 that I choose are left up to me.

4 Q So that this allowance, whether there is an
5 allowance or not, is not able to be measured, am I correct,
6 whether -- whether the examiner is allowed -- allowed for
7 uncertainty in the responses of the candidate is not
8 measured then?

9 A Myself, between -- are we talking about my ability
10 as an examiner or my ability as compared to other examiners'
11 and how we make it consistent?

12 Q Well, that is one of the problems with these
13 operating oral examinations. What you are saying, there is
14 not only the -- there is not only the variation between
15 examiners but there -- there can also be variations within
16 examiners without a standardization -- standard form.
17 Without some -- without some methods being imposed both of
18 asking the question and grading the question as the
19 questions are given.

20 A I believe they are consistent, and the answers are
21 graded upon receipt.

22 Q Not step by step, but at the end of the exam; is
23 that correct?

24 A No. I grade a person as I go through the exam,
25 make comments upon his response to a given question. I use

1 that response in the follow-up question.

2 (Mr. and Mrs. Aamodt conferring.)

3 MRS. AAMODT: All right, thank you very much, Mr.
4 Boger.

5 DR. LITTLE: You are saying it is somewhat like an
6 oral examination: when you see an area of weakness you can
7 pursue it?

8 THE WITNESS: Exactly.

9 MRS. AAMODT: I did have one other question.

10 BY MRS. AAMODT: (Resuming)

11 Q An explanation of Category L in Section 55.23. I
12 did not understand that category.

13 A Is there a question?

14 Q Yes. What is -- what does -- what is Category L
15 addressing in the senior reactor operator's written exam?
16 Or is that --

17 A We are talking about the scope of operating --

18 CHAIRMAN SMITH: There was complete cross-talk
19 there. Ask your question again and let the answer come
20 back.

21 BY MRS. AAMODT: (Resuming)

22 Q Mr. Boger, in Category L, Section 55.23 of the --
23 that is talking about the operating exam, the necessity for
24 careful approach to the responsibility associated with the
25 safe operation of the facility, what is that category

1 about?

2 A I would hesitate to call it a category. It is a
3 concept that we evaluate throughout the entire operating
4 test. It is a knowledge of the operation of the facility.
5 It is administrative procedures, tech specs, security,
6 health/physics. It is a reaction to the individual's
7 reaction to the plant management's requirements for
8 operation of the facility, how well does he understand them
9 and follow them.

10 (Mr. and Mrs. Aamodt conferring.)

11 MRS. AAMODT: Okay, thank you, Mr. Boger.

12 CHAIRMAN SMITH: This would be a good time --

13 (Board conferring.)

14 CHAIRMAN SMITH: All right, we will take our lunch
15 break and return at 1:10.

16 (Whereupon, at 12:10 p.m., the hearing recessed,
17 to reconvene at 1:10 p.m. this same day.)

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AFTERNOON SESSION

1

2

(1:15 p.m.)

3

CHAIRMAN SMITH: I received a letter of February
4 10 un which you added a copy of Table 5, Mr. Blake, to Mr.
5 Dieckamp's testimony. Table 5 was already on my copy, and
6 it is the same Table 5 that -- so maybe your concern was --

7

MR. BLAKE: That is a stumper to me because all
8 the copies that I was able to review over in the office did
9 not include it.

10

DR. JORDAN: Mine did not either.

11

MR. BLAKE: Yours didn't, so you needed the extra.

12

DR. JORDAN: Yes.

13

MR. BLAKE: It is a stumper to me, Mr. Smith. I
14 don't know how you got it.

15

CHAIRMAN SMITH: Well, unless this was received --
16 if it was received up in our office -- no, my copy had it,
17 unless Ms. Moran slipped it in.

18

MR. BLAKE: It is better to have two than none, I
19 guess.

20

CHAIRMAN SMITH: Sure.

21

Mrs. Aamodt, over the lunch break, did any
22 additional examination occur to you?

23

MS. AAMODT: Just one question.

24 Whereupon,

25

BRUCE BOGER,

1 the witness on the stand at the time of recess, resumed the
2 stand, was further examined and testified as follows:

3 CROSS EXAMINATION -- Resumed

4 BY MS. AAMODT:

5 Q Mr. Boger, the questions on the TMI 2 event on the
6 NRC examination, are they the same questions as the five in
7 the category thermodynamics?

8 A I believe any questions related to the TMI 2
9 accident could show up in several categories. It could show
10 up in the category that addressed administrative controls.
11 It could show up in the category on heat transfer and
12 thermodynamics. It could show up on the category of general
13 operating or specific operating characteristics.

14 MS. AAMODT: All right, thank you.

15 CHAIRMAN SMITH: Mr. Dornsife.

16 BY MR. DORNSIFE:

17 Q Mr. Boger, on the NRC written examinations, do the
18 SROs have to pass the same examinations as ROs and then have
19 to take an additional test, or are there two separate tests?

20 A Two separate tests.

21 Q Are they both the same length?

22 A The SRO exam has two fewer categories, so it is
23 shorter by two hours.

24 (Pause)

25 Q Do you feel that the SRO exam is more

1 comprehensive? In other words, it requires more analytical
2 ability on the part of the operator as far as its content is
3 concerned?

4 A Yes.

5 Q So that is how you make up as far as difference in
6 time? It is not -- it is still an audit exam, but because
7 it is more comprehensive, you feel it better tells you as
8 far as his abilities, his specific responsibilities?

9 A Right. The SRO would be expected to answer more
10 of the what-ifs than an operator would. It would get into
11 deeper discussions.

12 Q Concerning the oral tests, can you describe for us
13 what a typical question on an oral test would be? I mean,
14 is it just a matter of going through, walking through an
15 operating procedure, or is it much, much more detailed than
16 that?

17 A What you suggest is maybe one aspect of an exam.
18 In order to determine an applicant's ability to use the
19 procedures or familiarity with the procedures, we would ask
20 them to start a feedwater pump and get out the procedure and
21 go through the precautions, limitations and operating
22 conditions. That would be one way of asking questions
23 about, say, the feedwater system.

24 Another way would be to discuss the failure of
25 that same feedwater pump and discuss the transient that

1 would ensue, and thereby you would talk about the feedwater
2 system or loss of feedwater flow. You could also look at
3 the tech specs required on emergency feedwater and get into
4 the system that way.

5 Q So you would you ask questions as, if this were to
6 happen, what would be the response of the instruments, those
7 types of questions?

8 A That is correct.

9 Q How do you cover Items J and K on 55.23 of the
10 regulations in these oral tests?

11 A ~~We~~ have a section of our oral exam that deals with
12 radiation theory, essentially, and in it we would, for a
13 senior operator, we would look at his knowledge of like an
14 ALARA program, how he would apply the principles of time,
15 distance and shielding to that program. We would look for
16 the limits on -- facility limits on contamination, exposure
17 limits, special controls, respiratory equipment. We would
18 ask questions along those lines.

19 As far as K goes, we would generally imposed upon
20 a senior candidate an accident which leads to off-site
21 releases, and we would expect the senior operator to go
22 through his procedures and evaluate the release and come up
23 with the notifications that would be required. We would
24 expect them to know the emergency plan.

25 Q Would this include his decision-making ability as

1 far as protective action recommendations were concerned?

2 A As far as the emergency plan allows him, yes. We
3 expect the senior reactor operator to act as the emergency
4 director.

5 Q So you feel your exam is comprehensive enough that
6 you can gauge his ability to make those decisions concerning
7 protective action recommendations he would be giving to
8 off-site agencies.

9 A Yes.

10 Q Does the NRC observe and evaluate the operators'
11 performance and attitudes during on-shift operations after
12 they have a license?

13 A No. We do not. That falls under the Inspection
14 and Enforcement activities.

15 Q To your knowledge, to Inspection and Enforcement
16 people perform that function?

17 A I believe so.

18 Q Is there any formal evaluation program that you
19 know of that they use or just a matter of observing it maybe
20 as part of an inspection?

21 A I am sure they observe it in their general entry
22 into the control rooms and review of control room logs. You
23 get a feeling for how the operatives have been operating and
24 how conscious they are for alarms and logging. We get that
25 same feeling as we go through control rooms. I do not know

1 how formal it becomes though.

2 Q Do you know whether the resident inspector has any
3 particular responsibilities concerning observing operator
4 performance?

5 A I do not know. I cannot answer that.

6 CHAIRMAN SMITH: Before you leave that point,
7 would the LERs which categorize reportable events into
8 operator error and non-operator error, are those evaluated
9 with respect to the competence of operator crews?

10 THE WITNESS: Right now it is not. That is one of
11 the action plan items, to take a look at the LERs and see if
12 there isn't a way that we can identify personnel by name or
13 by crew to find out, you know, whether it is a crew that is
14 having more operational occurrences than another one. We do
15 not do that right now. The LER just says, you know, human
16 error or operational error.

17 CHAIRMAN SMITH: Okay. We are getting out of
18 your area.

19 THE WITNESS: I believe so.

20 CHAIRMAN SMITH: We will cover that.

21 BY MR. DORNSIFE: (Resuming)

22 Q This may again be out of your area, but are you
23 familiar with the required drills that are performed on a
24 shift basis during the annual drill and other emergency
25 drills that are performed periodically?

1 A I am not familiar with the ones that take place at
2 TMI.

3 Q Just in general.

4 A Yes, I am. It is my past experience.

5 Q Does the NRC evaluate these drills?

6 A They have not in the past.

7 Q Pardon me?

8 A I said they have not. Well, the drill that the
9 NRC would observe would be the annual emergency plan drill.
10 There are other drills that are performed on shifts, just of
11 a shift nature without requiring any off-site notification,
12 but the emergency plan or the annual emergency plan review
13 is observed by the NRC.

14 Q And are the operators' performances evaluated
15 during that drill?

16 A Yes, I would say they are, just to make sure that
17 the appropriate responses or the appropriate actions were
18 taken in response to the plan.

19 Q Could a license be taken from an operator for his
20 performance during one of these drills?

21 A I do not know.

22 CHAIRMAN SMITH: Is the action against an
23 individual operator part of your area of responsibility or
24 would that be I&E?

25 THE WITNESS: It becomes I&E's responsibility.

1 BY MR. DORNSIFE: (Resuming)

2 Q Are you aware of any NRC requirements for
3 non-licensed operators?

4 A In a general sense, I am aware that there are
5 regulatory guides that address unlicensed people.

6 Q As far as their training is concerned.

7 A No.

8 Q There is none?

9 A I am not familiar with --

10 Q You are not familiar with --

11 A Other departments are.

12 Q Okay.

13 How about as far as they relate to emergency plan
14 functions?

15 A I cannot address that.

16 MR. DORNSIFE: Mr. Chairman, is the testimony of
17 Mr. Boger's on CEA 13 still alive? We had a question on
18 that?

19 CHAIRMAN SMITH: Yes, it was received into
20 evidence, and as such, it is open for full range of
21 examination.

22 BY MR. DORNSIFE: (Resuming)

23 Q Back along the same line I was asking previously
24 about observing operator performance, was there any
25 consideration given to observing operator performance on the

1 simulator as far as an overall evaluation of the general
2 competence of licensed operators?

3 A At this point in time we do not give simulator
4 exams. However, we are intending to give simulator exams in
5 the future.

6 Q Would you consider that to be a more objective
7 method of determining their overall competence?

8 A I hesitate to say more objective. If you happen
9 to have a reactor that has a site-specific simulator, you
10 can determine better how the operator will respond and how
11 he can use the controls. If you do not have a site-specific
12 simulator, then you introduce the concern of whether he is
13 just unfamiliar with that particular simulator's controls.

14 Q On page 5 of your testimony regarding CEA
15 Contention 13, you talk about changes in the emergency
16 procedures, and I am wondering, in your testimony did you
17 consider the ATOG procedures and how they could possibly
18 change your testimony?

19 A I have considered ATOG. I am trying to read my
20 testimony to see if it would change. I am sure that the
21 ATOG concept will change the general method in which an
22 emergency procedure is handled. Rather than being accident
23 oriented, it will be symptom oriented, whereas an operator
24 will be required to take actions based on symptoms rather
25 than requiring the operator to evaluate an accident and then

1 take action. I am sure that we will still require them to
2 go back and, you know, verify certain parameters, maintain
3 subcooling, some of those items. So I do not see where the
4 ATOG would drastically change this.

5 Q But you have no plans on examining the operators'
6 ability to use the ATOG procedures when you license them, I
7 assume because they probably will not be in effect by the
8 time of the license, is that correct?

9 A Yes, for -- it depends on whether the ATOG program
10 is implemented. As soon as the emergency procedures change,
11 then we would examine to those new emergency procedures.

12 Q In other words, if the exam is done before the
13 change, you will go back and examine the operators based on
14 the changes to the procedure.

15 A No, we would not. The time that they would be
16 re-examined on new procedures would be as part of their
17 requalification program, where they would be expected to
18 review changes to procedures and then demonstrate a
19 knowledge.

20 Q Based on the experience you have had at other
21 plants, what has been the effect of increasing the passing
22 grade criteria for license exams? Has the percent of people
23 passing changed?

24 A Yes.

25 Q Which --

1 A We found that the new criteria has caused more
2 people to fail the exam.

3 Q Are there any specific conclusions that you have
4 reached through those results other than just, you know,
5 observing that that happened?

6 A No. I think that we draw several conclusions,
7 some that -- that some people have had good success with
8 passing these exams, and we feel that they have upgraded
9 their training program and their requirements to the point
10 where they can pass this exam. So we think that the
11 increased criteria means that they have to have better
12 training.

13 MR. DORNSIFE: That is all the questions I have.

14 CHAIRMAN SMITH: Mr. Blake.

15 MR. BLAKE: I have no questions of this witness.

16 CHAIRMAN SMITH: Mrs. Aamodt, do you have any
17 questions on the questions that Mr. Dornsife asked?

18 MS. AAMODT: No, I do not.

19 CHAIRMAN SMITH: All right, Mr. Swanson.

20 MR. SWANSON: I have just one question.

21 REDIRECT EXAMINATION

22 BY MR. SWANSON:

23 Q Mr. Boger, will you please clarify the
24 relationship between NUREG-0660 and specifically the Task
25 I.A.2 and I.A.3 with Commission's August 9, 1979 Order Item

1 I.E?

2 A Yes. Order Item I.E. was or is very specific in
3 the nature of the training and testing that is required by
4 the Commission. The NUREG-0660 is an overall assessment of
5 the training program -- well, of actions to be taken by the
6 NRC in response to the TMI 2 accident. Included in that
7 document are some overall changes to operating, licensing
8 and training. It happens that the NUREG encompasses Item
9 I.E, but Item I.E is separate from NUREG-0660.

10 Q NUREG-0660 is merely a recommended pan of action
11 as opposed to a requirement, isn't that correct?

12 A That is correct, and will require additional study
13 on the staff's part.

14 Q But when you develop a test, though, in your
15 examination of operators, you specifically refer to Item I.E
16 of the Commission's Order, Part 55 requirements and staff
17 requirements set forth in instructions from Mr. Denton in a
18 March 28, 2980 letter to Licensees. Those are the elements
19 that you specifically encompass in your testing of
20 operators, is that not true?

21 A That is correct. We would have to use all those
22 elements.

23 MR. SWANSON: Thank you. That is all.

24 BOARD EXAMINATION

25 BY MR. SMITH:

1 Q Mr. Roger, is there any position in NRC licensing
2 for just periodic re-examination of operators after a given
3 amount of time?

4 A Yes, sir. Right now each utility is required to
5 give an annual exam, facility-administered exam that we in
6 NRC review every two years or so, to look at the exam
7 content and grading, to make sure that they maintain an
8 equivalent NRC exam. In the future, one of the action plan
9 items is for the NRC to administer requal exams. That is
10 being considered.

11 CHAIRMAN SMITH: Anything further?

12 (No response.)

13 CHAIRMAN SMITH: Okay.

14 THE WITNESS: Thank you.

15 DR. JORDAN: Just a second.

16 CHAIRMAN SMITH: Oh.

17 BY DR. JORDAN:

18 Q I guess I am a little puzzled about -- you say
19 that the recommendation I.A.3 in NUREG-0660 -- that is what
20 you were referring to, was it?

21 A Yes, sir.

22 Q Now, you say that is not a requirement. Isn't
23 that included in the 0737 as a requirement?

24 A Right. Many of the recommendations in the task
25 action plan have been adopted and have been required of the

1 different licensees. I am not sure how many of those
2 specific recommendations show up in 0737, but many of them
3 do.

4 Q I see. So it is just -- at least some of the
5 requirements have been adopted -- I mean, some of the
6 recommendations of 0660 have been adopted as requirements.

7 A Yes, sir.

8 DR. JORDAN: All right.

9 BY CHAIRMAN SMITH: (Resuming)

10 Q Was that the point of your answer, however?

11 A I was trying -- it seemed like we got confused as
12 to what Order Item I.E required and what the task action
13 plan required, and I was trying to draw out the differences
14 between the two. One is very site-specific whereas the
15 action plan is for all licensees.

16 Q Right, and to the extent that 0660 is brought over
17 into 0737, the same answer would apply.

18 A Yes, sir.

19 CHAIRMAN SMITH: Anything further?

20 RE CROSS EXAMINATION

21 BY MS. AAMODT:

22 Q Could I ask, Mr. Eoger, have these requirements
23 that we have discussed been brought over into 0737? Is it --

24 CHAIRMAN SMITH: You mean particularly the one
25 that we had --

1 MS. AAMODT: Discussed.

2 CHAIRMAN SMITH: Let's ask him.

3 Do you know? I guess we could find out for
4 ourselves in short order, but if he knows the answer --

5 THE WITNESS: I am afraid I cannot say how many
6 have or have not.

7 CHAIRMAN SMITH: Okay. Both documents are
8 available. If anybody can give us the parallel part of
9 0737, that might be helpful.

10 (Board conferring.)

11 CHAIRMAN SMITH: Dr. Jordan has pointed out he
12 himself did that very thing. All we need now is a
13 comparison.

14 (Board conferring.)

15 CHAIRMAN SMITH: I do not think that the answer is
16 going to be J. is rather dispersed.
17 I.A.2-3 also picks up some parts of it. It will just take
18 comparisons.

19 MS. AAMODT: Okay.

20 CHAIRMAN SMITH: Do you have a copy of 0737?

21 MS. AAMODT: I am sure I do at home.

22 CHAIRMAN SMITH: Well, look at, for example, pages
23 3-38 and 3-36 and 3-37. That is, yes, 3-36 through 3-39.

24 MS. AAMODT: Okay.

25 CHAIRMAN SMITH: Note that I said for example. I

1 do not know if that is all-inclusive or not.

2 MS. AAMODT: All right.

3 CHAIRMAN SMITH: Okay, Mr. Roger. Thank you very
4 much.

5 (The witness was excused.)

6 (Pause)

7 CHAIRMAN SMITH: I believe now we are ready for
8 Mrs. Aamodt's testimony.

9 Mr. Aamodt, would you like for the Board to go
10 through the procedure that is followed by attorneys to get
11 the -- if you want a chance to try it yourself, now is an
12 opportunity.

13 MR. AAMODT: If you would be so kind as to give me
14 a little advice beforehand, I would like to try to help.

15 CHAIRMAN SMITH: What we do is we establish that
16 the document that represents the written testimony is indeed
17 the written testimony prepared by the witness, and you
18 describe it, and then you ask if there are any corrections,
19 that the corrections are made, and then you ask that it be
20 bound into the transcript as if it was read into the
21 transcript.

22 But you accomplish any of those things in any
23 particular order except the last. I think you will
24 succeed. Just go ahead.

25 As a matter of fact, she can just do it

1 narratively, so long as all those points are touched.

2 MR. AAMODT: I am concerned about being helpful
3 later on in the cross examination.

4 CHAIRMAN SMITH: Let me qualify this.

5 MR. SWANSON: Mr. Chairman, if it will be helpful,
6 the staff would be willing to stipulate the testimony into
7 evidence subject to motions to strike.

8 MR. AAMODT: I think my wife has a few things she
9 would like to add to the testimony.

10 CHAIRMAN SMITH: Okay.

11 In the first place, we have to administer the oath.

12 Do you want a moment to get your papers in order?

13 MS. AAMODT: Yes. I do not believe my husband has
14 sorted them. There is one set for the reporter.

15 (Mrs. Aamodt distributing documents to the Board
16 and parties.)

17 CHAIRMAN SMITH: Have you provided a copy of your
18 testimony for the reporter?

19 MS. AAMODT: Yes, the testimony was provided.

20 CHAIRMAN SMITH: Where is that copy right now?

21 MS. AAMODT: Do you need one, Chairman Smith?

22 CHAIRMAN SMITH: The reporter has one?

23 MS. AAMODT: There is an additional one in the
24 orange folder there next to you, Norman.

25 CHAIRMAN SMITH: I would like to be assured that

1 the reporter has the one that ends up with all the
2 corrections that I note. I note a correction is necessary.
3 I note that there is --

4 MS. AAMODT: Is there a correction page on the
5 front of that, Chairman Smith? That should be taken off
6 because that no longer holds.

7 I will go through it and make my corrections.

8 CHAIRMAN SMITH: This should be returned.

9 Shall we throw this correction page away? Do you
10 want this back?

11 MS. AAMODT: No, the correction page can be thrown
12 out.

13 On page 1 --

14 CHAIRMAN SMITH: Wait a minute. Let's first
15 establish the correct document, I mean the actual document
16 which is going to be received as your testimony.

17 So we begin with a document that is dated February
18 2, 1981, except that the title of it says Intervenor
19 Marjorie Aamodt's and Norman Aamodt's Testimony and Plan of
20 Cross-Questioning.

21 Now, we have already ruled on Mr. Norman Aamodt's
22 testimony, and the plan of cross questioning does not go
23 into evidence. So what I propose we do is we draw a line
24 through "and Norman Aamodt's Testimony and Plan of
25 Cross-Questioning" so that the document will actually

1 reflect what is going into evidence.

2 Now, I will do this for the reporter's copy.

3 Is that all right with you?

4 MS. AAMODT: That is fine. On page 1 --

5 CHAIRMAN SMITH: Just give me a moment.

6 Now I am going to remove from it Norman Aamodt's
7 testimony, leaving six pages of testimony by Marjorie Aamodt.

8 MR. BLAKE: Excuse me. Six pages?

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1 CHAIRMAN SMITH: Nine pages of testimony from
2 Marjorie Aamodt. Is that correct, Mrs. Aamodt?

3 MRS. AAMODT: Yes.

4 CHAIRMAN SMITH: Plus the qualifications of
5 Marjorie Aamodt. That same paper also has the qualification
6 of Norman Aamodt. I see no harm in having those remain
7 there, unless anybody objects.

8 The plan for cross questioning should be removed.
9 Is that correct, Mrs. Aamodt? It is not going to be
10 evidence.

11 (No response.)

12 CHAIRMAN SMITH: All right, do you have any
13 corrections to the nine pages of testimony or your
14 professional qualifications?

15 MRS. AAMODT: There are changes, Mr. Smith.

16 CHAIRMAN SMITH: Changes?

17 MRS. AAMODT: Yes.

18 CHAIRMAN SMITH: Okay. Would you begin with them,
19 then? The reporter does not have these changes, does he?

20 MRS. AAMODT: No. I am sorry, I was not aware of
21 that need.

22 CHAIRMAN SMITH: Okay. So I will try to make the
23 changes. Let's go off the record.

24 (Discussion off the record.)

25 CHAIRMAN SMITH: Okay, now would you begin with

1 your first correction?

2 MRS. AAMODT: Yes. On page 1 the third paragraph
3 right underneath the restatement of the Contention, the
4 review committee of the OARP, insert "of the OARP."
5 Whereupon,

6 MARJORIE M. AAMODT
7 called as a witness, having first been duly sworn by the
8 Chairman, was examined and testified as follows:

9 DIRECT EXAMINATION

10 BY MR. AAMODT:

11 Q What is it?

12 A "Of the OARP."

13 Q Okay.

14 A The last sentence on the page, remove the period
15 and put "in view of the TMI-2 accident."

16 Q Okay.

17 A On page 2, the sentence just above where it says
18 "Man trained machine human-engineered interface," the
19 sentence begins with "But unknown effects." Change
20 "unknown" to "unmeasured."

21 CHAIRMAN SMITH: No, not on my --

22 BY MR. AAMODT: (Resuming)

23 Q The sentence does not begin with "But."

24 A It says --

25 Q The line begins "But."

1 A The line begins with "But." "But unmeasured
2 effects," not "unknown measured effects." "Unmeasured
3 effects."

4 At the bottom of that page, "C: carpeting to
5 reduce noise," and so forth, put an asterisk at "C." Add
6 the footnote, "Attachment 5."

7 Q All right.

8 A Page 3, the first paragraph under the D and E, it
9 begins the first "3" of that paragraph, where it says near
10 the end of the paragraph, "In the sense, it is a man" --
11 "machine-man/machine-plant interface," an asterisk after
12 that, and Attachment 4 as a footnote.

13 Just underneath that it says --

14 CHAIRMAN SMITH: I am sorry, I just had trouble
15 finding it. All right.

16 THE WITNESS: Just underneath that --

17 CHAIRMAN SMITH: The asterisk will go immediately
18 following the word "interface"?

19 THE WITNESS: "Interface." That is right.

20 The next line, it says "which can" --

21 CHAIRMAN SMITH: What does the asterisk refer to?

22 THE WITNESS: Attachment 4.

23 CHAIRMAN SMITH: Okay.

24 THE WITNESS: On the next sentence it says "which
25 seriously fatigue." I want to change that to "which can

1 seriously fatigue." Insert "can."

2 CHAIRMAN SMITH: That is already on this.

3 THE WITNESS: On the next page, after the center
4 of the page, Pennsylvania Power & Light Company, and then
5 there is a parentheses, which is Attachment 1.

6 CHAIRMAN SMITH: Change "attach" to "Attachment
7 1"?

8 THE WITNESS: To "Attachment 1."

9 At the bottom of the page it says "Oak Ridge," the
10 last word, "Oak Ridge," and add "and others."

11 Page 5, under D, add onto the last sentence --

12 CHAIRMAN SMITH: There are two Ds.

13 THE WITNESS: The D at the beginning --

14 CHAIRMAN SMITH: All right.

15 THE WITNESS: -- of the page, personnel.

16 BY MR. AAMODT: (Resuming)

17 Q Paragraph D, personnel.

18 A The last sentence says "Possible analyses of
19 programs and inferences."

20 CHAIRMAN SMITH: "Program inferences"?

21 THE WITNESS: "... and inferences."

22 In the middle of the page, B, faculty, an asterisk
23 there and a footnote Attachment 2.

24 CHAIRMAN SMITH: Where is the asterisk exactly?

25 THE WITNESS: Well, this is -- this is not as

1 exact as I would have done if I had known all I should have
2 known at the time I did it. I -- I ran short of time, and
3 so it is not precise. I would say at the end of that, at
4 the end of that, after "licensing," "NPC licensing."

5 CHAIRMAN SMITH: What is the footnote? What is
6 the footnote, Mrs. Aamodt?

7 THE WITNESS: Attachment 2. And second --

8 BY MR. AAMODT: (Resuming)

9 Q Page 7?

10 A Page 7. The third paragraph on the hour -- the
11 schedule, I have the attachment referring to the earlier
12 February 1, but the hourly schedule is the same. So I guess
13 we will just put an asterisk there and "Attachment 3" at the
14 bottom of the page.

15 Q Where would you like the asterisk?

16 A After "72-hour work week."

17 Q And that becomes Attachment 3?

18 A Attachment 3. And then maybe a clarification,
19 hours designated in this letter, same as July 31, 1980.

20 CHAIRMAN SMITH: We have to know exactly where
21 those words go.

22 THE WITNESS: What is that? I use as Attachment 3
23 the February 1 letter, and I see I refer to the July 31
24 letter, they are the same. Recommendation of ours.

25 Q Margie, would you perhaps change July 31 to a

1 different day?

2 A All right, why don't we put, "However, in a letter
3 to" -- it is not a letter, though. This is -- this is in
4 circular -- all right, let's change that: "However, in
5 circular I.E.80-02."

6 Q Excuse me. In Circular --

7 A "In Circular I.E.80" --

8 Q "I.E.80"?

9 A "I.E.80-02" --

10 CHAIRMAN SMITH: Mrs. Aamodt, could that be
11 "Bulletin"?

12 THE WITNESS: What's that?

13 CHAIRMAN SMITH: Could that be a bulletin?

14 THE WITNESS: Is that a bulletin?

15 CHAIRMAN SMITH: A "bulletin" is a word that has
16 generally recognized meaning.

17 THE WITNESS: All right.

18 MR. BLAKE: In this case it was a circular.

19 CHAIRMAN SMITH: It was a circular. All right.

20 Just mind my own business. All right.

21 THE WITNESS: It is dated February 1, 1980. Then
22 put an asterisk.

23 CHAIRMAN SMITH: Dated February?

24 THE WITNESS: 1, 1980.

25 CHAIRMAN SMITH: 1, 1980.

1 THE WITNESS: "As well as in letter dated July
2 30."

3 BY MR. AAMODT: (Resuming)

4 Q Is there an asterisk yet?

5 A The asterisk?

6 Q "However, in Circular I.E.80-02, dated February 1,
7 1980." Now, continue.

8 A "1980, as well as in letter to Licensees dated
9 July 31, 1980." Now, the asterisk is after the "Circular
10 I.E.80-02," and that is Attachment 3.

11 Q I am sorry, I could not keep up with you.

12 "However, in Circular I.E.80-02, dated February 1" --

13 A That is in there, Norman, "as well as letter to
14 Licensee." "Letter to Licensee" is in there. All you need
15 is "as well as."

16 Q I struck it out, so I have to put it in again.

17 A "As well as in letters to Licensees."

18 Q "Dated February 1, 1980"?

19 A "July 31, 1980."

20 CHAIRMAN SMITH: Now we are going to have to
21 correct your change. The asterisk does not follow the word
22 "week."

23 THE WITNESS: No. It follows "Circular
24 I.E.80-02."

25 CHAIRMAN SMITH: All right.

1 BY MR. AAMODT: (Resuming)

2 Q It follows the "2"?

3 A "02." That is Attachment 3.

4 Then on page 8 --

5 Q That is Attachment 3?

6 A 3. I think you are in the dead spot. Why don't
7 you move over?

8 Q No, I can hear you all right.

9 A Can you?

10 Q The asterisk simply says "Attachment 3" now?

11 A That is right. "Page 8" is the first line. The
12 end of the sentence, near the end of the sentence it says
13 "shifts," and after "shifts," "revolving shifts," insert "as
14 proposed by Licensee."

15 CHAIRMAN SMITH: Wait a minute. No. That doesn't
16 comport --

17 THE WITNESS: Is that in there?

18 BY MR. AAMODT: (Resuming)

19 Q That is in there.

20 A All right. At the end of that paragraph, "to
21 sleep at traditional times considered effective in reducing
22 fatigue."

23 Q That is in there also.

24 A All right. And eliminate the "attached" there.
25 That is not attached.

1 Q I do not see that.

2 A All right. Oh, okay, I am sorry. No, that is not
3 there. I am sorry. Now, down below, the next paragraph --

4 CHAIRMAN SMITH: Excuse me. I understand what her
5 point is. She does have an asterisk at the bottom of the
6 page, which says "attached."

7 THE WITNESS: But that is to the letter down here.

8 CHAIRMAN SMITH: That remains.

9 THE WITNESS: Yes.

10 CHAIRMAN SMITH: All right.

11 THE WITNESS: That paragraph beginning "Attitudes"
12 can --

13 CHAIRMAN SMITH: We do not understand. We need
14 some clarification.

15 THE WITNESS: I misunderstood my own --

16 CHAIRMAN SMITH: On my copy -- and Dr. Jordan's
17 does not include this -- but my copy has an asterisk at the
18 bottom of the page which says "attached." Now I do not see
19 the antecedent. Oh, I see, the antecedent to the asterisk
20 is in the paragraph which begins "Attitudes." The last line
21 of that paragraph, you have, "Subsequently, April 30, 1980*,
22 NRC." That is speaking with operators about the
23 responsibilities to the public at large on a trial basis.
24 Does that comport with --

25 MR. BLAKE: No. Read me the "subsequently"

1 sentence?

2 CHAIRMAN SMITH: "Subsequently, April 30, 1980" --

3 MR. BLAKE: No. That does not agree with my text.

4 THE WITNESS: That should be completely crossed
5 out. Where it says "The surrounding public," if you back up
6 just a little from that sentence, it says "The surrounding
7 public" was the wording on his license and whatever was
8 given by the utility. Then where it begins "Subsequently,"
9 that is crossed out all the way down to the end of the
10 paragraph as well as the asterisk and the attached as the
11 footnote.

12 BY MR. AAMODT: (Resuming)

13 Q Everything from "Subsequently" through "a trial
14 basis." That is right. And the asterisk and the attached
15 footnote goes.

16 (Pause.)

17 MR. SWANSON: Could I ask a question? The
18 Chairman's last question indicated that obviously there were
19 two sets of this testimony passed out, and I wonder if you
20 are aware are there any differences? Are there differences
21 between the sets that you distributed?

22 BY MR. AAMODT: (Resuming)

23 Q Did you strike that out between the time I got the
24 first two copies and the second two copies? Because it is
25 not stricken from my copy either.

1 A No, no, I am sorry, I struck that after we came
2 here and we discussed it in cross questioning.

3 Q The trips to your office -- I realize it did not
4 apply.

5 CHAIRMAN SMITH: There is still a problem raised
6 by Mr. Swanson, and that is there is a possibility, since we
7 know that there are two completely different versions of at
8 least page 8 in circulation. Is there any other possibility
9 --

10 MR. AAMODT: May I compare mine?

11 THE WITNESS: That is not true, Chairman Smith.
12 The "Subsequently" was just crossed off this morning in the
13 car coming here.

14 MR. BLAKE: My last sentence -- it may be the same
15 as Dr. Jordan's. He has been nodding at the same time I
16 have.

17 CHAIRMAN SMITH: I am looking at two different
18 typed versions, Mrs. Aamodt. On page 8, Dr. Jordan's, the
19 sentence, and Dr. Little's begins "Subsequently, October
20 'blank'" --

21 THE WITNESS: And the other one, "Subsequently,
22 April 30." Just the date. And then I crossed it completely
23 out. I could not find the letter at first, and I thought
24 that was one I remembered.

25 MR. AAMODT: There must have been some copies.

1 THE WITNESS: Yes.

2 BY MR. AAMODT:

3 Q With those pages out, the sentence out, the
4 sentence beginning "Subsequently," ending "basis." That
5 sentence was the only sentence that varied between the two
6 sheets, was it not?

7 A All that varied was the date of the letter.

8 Q Yes.

9 A On page 9 --

10 CHAIRMAN SMITH: Are there other sheets where this
11 could be a potential -- are there other sheets in your
12 testimony where this could be a potential problem? Are
13 there other sheets?

14 THE WITNESS: No. No. No. I am giving all the
15 changes. And then on page 9 --

16 BY MR. AAMODT: (Resuming)

17 Q What Mr. Smith meant, Marge, are there any other
18 pages where you change something where we could have two
19 different copies floating around?

20 A No.

21 Q Okay.

22 A On page 9, the second sentence, "Develop to
23 optimize" and insert "responsibility in using training" on
24 this copy. Cross out the "and" and put "in performance."

25 Q That is done. That was made in this copy.

1 CHAIRMAN SMITH: That change has already been

2

3 THE WITNESS: What is that?

4 CHAIRMAN SMITH: That change has been made.

5 THE WITNESS: Oh, all right. And at the very
6 bottom of the page -- did I say under "conclusions," "there
7 are" or "there is"? It should be "there are."

8 CHAIRMAN SMITH: That change, I think, has been
9 made.

10 MR. AAMODT: Yes.

11 BY MR. AAMODT: (Resuming)

12 Q Do you have any other corrections, Margie?

13 A No.

14 Q Do you have any additions?

15 A Oh, then there is -- the addition of Attachment 1
16 was here. Attachment 2 has been distributed; that is a new
17 attachment.

18 CHAIRMAN SMITH: All right, Attachment 1 was --

19 THE WITNESS: Given originally with the
20 testimony.

21 CHAIRMAN SMITH: It is not marked "Attachment 1."
22 That is the newspaper?

23 THE WITNESS: That is the newspaper.

24 CHAIRMAN SMITH: Let's mark that "Attachment 1."

25 MR. AAMODT: I have none of those attachments

1 here. Could we -- could you keep them there and we will add
2 them to this one, or I can give this to you now. It is
3 corrected.

4 THE WITNESS: We can get the --

5 CHAIRMAN SMITH: We might just as well get the
6 attachments lined up. So far I have a copy of a document
7 that can be given to the reporter. And I can share my
8 colleagues', at least for this afternoon. But our first
9 problem now is to identify Attachment 1. And that is the
10 newspaper article with the headlines "Simulator Prepares
11 TT&L Nuclear Staff." We will mark that Attachment 1.

12 You don't have that?

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1 MR. AAMODT: I don't have that for the Reporter's
2 COPY.

3 CHAIRMAN SMITH: So far I do.

4 MR. AAMODT: Okay.

5 THE WITNESS: Attachment 2 is --

6 CHAIRMAN SMITH: Wait a minute. Now, when I begin
7 to run out of attachments --

8 MR. AAMODT: Attachment 2 is marked as Attachment
9 2.

10 THE WITNESS: Attachment 2 is so marked.

11 CHAIRMAN SMITH: None of us have that.

12 THE WITNESS: None of you have that?

13 CHAIRMAN SMITH: I don't have it. I heard Dr.
14 Little say that she doesn't have it, and I know that I do
15 not have all of the attachments.

16 All right.

17 THE WITNESS: This is -- Attachment 2 was put with
18 that. I see you have an extra Attachment 2 up there. You
19 will have another complete set when this is put with that
20 at the Reporter.

21 CHAIRMAN SMITH: Attachment 2 is an OARP quiz
22 results, function of instructor ratings.

23 THE WITNESS: And Attachment 3 is the Circular
24 80-02, and Attachment 4 --

25 CHAIRMAN SMITH: No, no.

1 MR. BLAKE: My Attachment 3 is one page of the
2 Circular 80-02.

3 THE WITNESS: That's right.

4 MR. BLAKE: It is the first of two pages which
5 comprise that in that circular.

6 MR. AAMODT: Yes, that is right. That is all we
7 copied was the first page.

8 THE WITNESS: We will give you a second copy of
9 that page. I am sorry.

10 CHAIRMAN SMITH: Okay.

11 THE WITNESS: I am sorry for these omissions on my
12 part. And the fourth -- the fifth -- the fourth attachment
13 is a diagram.

14 CHAIRMAN SMITH: We do not have that.

15 THE WITNESS: Do you have that, Chairman Smith?

16 CHAIRMAN SMITH: No, ma'am. Do the other parties
17 -- do the other people?

18 MR. BLAKE: Mr. Chairman, we got them handed out
19 to us after the lunch break and before Ms. Aamodt just went
20 up. We have not seen these before.

21 CHAIRMAN SMITH: Do you have more, because the
22 individual Board members will need this, too.

23 THE WITNESS: All right. All right.

24 CHAIRMAN SMITH: Attachment 4 is entitled
25 "Man-Machine Interface," showing the relationship of work

1 schedule to training.

2 THE WITNESS: I thought we had enough copies.
3 Norm went over and had them made, and I do not know where
4 they all went.

5 MR. AAMODT: We only made four. We should have
6 made six. Well, we can work from the Reporter's copy and
7 give it to him at the end of the testimony. Then we will
8 all have it tomorrow.

9 All right. How about Attachment 5?

10 MR. ADLER: Mr. Chairman --

11 THE WITNESS: Attachment -- was there an
12 attachment 5? I thought I went only to 4.

13 CHAIRMAN SMITH: Yes. There was a page you
14 referred to as Attachment 5.

15 THE WITNESS: Yes. I am sorry. That is -- that
16 is the decibels and the perception of --

17 CHAIRMAN SMITH: Page 174 and 175 from
18 publication, the chapter regarding physiological acoustics.
19 That is Attachment 5.

20 THE WITNESS: That is Attachment 5.

21 MR. ADLER: Mr. Chairman, I do not believe any of
22 the parties besides the Staff and the Licensee have gotten
23 copies of the attachments.

24 CHAIRMAN SMITH: Nobody else has? You have not
25 either?

1 MR. ADLER: We don't have any except for the
2 original, Attachment 1.

3 CHAIRMAN SMITH: All right. I think while we are
4 taking care of preliminary business we can have copies made
5 of the five attachments.

6 MR. ADLER: Thank you.

7 (Board conferring.)

8 CHAIRMAN SMITH: Do you have one, Mr. Aamodt?

9 MR. AAMODT: No.

10 CHAIRMAN SMITH: Do you have enough?

11 THE WITNESS: I am missing one myself, one or two
12 myself.

13 CHAIRMAN SMITH: All right. Seven, seven copies,
14 please.

15 Now, with those corrections, additions, and the
16 attachments in this your testimony and the professional
17 qualifications, your professional qualifications? Is this
18 your testimony?

19 THE WITNESS: Yes, it is, Mr. Smith.

20 CHAIRMAN SMITH: I suggest that we leave Mr.
21 Aamodt's professional qualifications in until we determine
22 whether -- before I strike it out, determine whether it
23 turns out that he contributed to part of the testimony.
24 Then if at the end of the testimony it appears he did not,
25 we will strike out his qualifications, too, if you remember

1 to make that motion.

2 Are there any objections to the receipt of Mrs.
3 Aamodt's testimony and professional qualifications with the
4 attachments?

5 MR. SWANSON: Yes.

6 CHAIRMAN SMITH: Mr. Blake?

7 MR. BLAKE: Mr. Smith, I have an objection to one
8 portion of Mrs. Aamodt's testimony that I referred to before
9 that I would object to. It's admissibility. It's the
10 portion that begins on page 7 on fatigue.

11 I would also observe that these attachments other
12 than the press clipping were not provided to the Licensee
13 and apparently not to the other parties in advance. I do
14 not know, but I would like to have at least an estimation.
15 We should not have a surprise on direct examination that we
16 should see for the first time when the Witness takes the
17 stand the nature of the direct case. It is quite different
18 in that regard from cross examination.

19 It may be that the Aamodts just did not understand
20 it and thought that this vehicle was appropriate. I do not
21 know. I have not seen these things together. Some I
22 recognize, like the ADC-2; others I do not, nor do I know
23 what means to be made of them, and I am not prepared today
24 to cross examine on them.

25 CHAIRMAN SMITH: Well, let's take up your

1 objection to page 7, to the portion on page 7.

2 MR. BLAKE: Mr. Smith, my objection to the one
3 discrete area which appears -- starts on page 7 and carries
4 over to the top of page 8, entitled "Another Stressor --
5 Fatigue," is the same objection which I raised earlier
6 during the course of cross examination of one of our panels
7 of witnesses.

8 Nowhere in that entire segment of her testimony
9 does the word "training" or the word "testing" appear. It
10 is indeed an attacking or an attempt to attack the
11 operational shift requirements, the rotating of shifts. It
12 deals exclusively with operational considerations.

13 The item which the Board has previously determined
14 is not within the Amodts' Contention No. 2. It has been
15 the subject of earlier discovery rulings. It was the
16 subject of a Board ruling during one of our panels of
17 witnesses. It has been the subject of other testimony,
18 testimony by others in this proceeding, specifically Mr.
19 Toole who specifically --

20 CHAIRMAN SMITH: You are going to have to speak
21 more slowly. If you begin with the last sub-subject, I did
22 not follow at all what you are saying about Mr. Toole.

23 MR. BLAKE: I was leading into the fact that it
24 has in fact been covered elsewhere in this proceeding, for
25 example, Mr. Toole's testimony which appears on page 11,665

1 with regard to shift rotation. The Aamodts were not present.

2 And finally, I would observe, Mr. Chairman, that
3 the Essex Report, which has been the subject of some
4 discussions and I think even referenced by Mrs. Aamodt,
5 although I am not certain of that, in its review of the
6 Three Mile Island Unit 2 accident it was observed in that
7 report that there was no evidence that at the time of the
8 accident the actions and the actions of the operators were
9 significantly influenced by fatigue, disorientation, or
10 distractions.

11 It is unclear to me that fatigue --

12 CHAIRMAN SMITH: You are giving me too much. I
13 cannot rule on all these things. Let's take up the first
14 part now, the part about it being beyond the scope of the
15 contention.

16 MR. BLAKE: Okay.

17 CHAIRMAN SMITH: All right. We did rule that we
18 could have sufficient identification but no more, so that
19 the alleged defective training could be identified and
20 placed into context.

21 Now, I think that the ruling should be that if the
22 information contained on page 7 and 8 under that subject is
23 reliable, that it should be allowed in for the purpose of --
24 for that limited purpose if it is reliable. You see, this
25 is consistent with our ruling during discovery, too. We

1 would not allow an inquiry into operating conditions, nor
2 did we allow during the course of the cross examination an
3 exhaustive inquiry into operating conditions and fatigue and
4 stress; but we did allow an identification and a limited
5 excursion into that area so that Mrs. Aamodt may make a
6 demonstration of her view that training was not parallel
7 training needs. It does not operate on needs. And this has
8 been an important part of her case.

9 I think our rulings have been consistent with
10 allowing at least this subject matter in, although --

11 MR. BLAKE: I can do no more than observe, Mr.
12 Smith, that there is nothing here to tie it to training or
13 testing. This entire section attacks the operational
14 considerations, the length of shift, which has been
15 established, the types of rotation. It makes suggestions
16 regarding different types of rotations and different hours.

17 CHAIRMAN SMITH: I will just have to read it more
18 carefully. I will have to take some time out.

19 MR. AAMODT: Mr. Smith, may I make an observation
20 before that relative to Ernie's comment? The section does
21 not stand by itself. This is in the context of the entire
22 testimony as opposed to testimony dealing with we should not
23 have long shifts.

24 This is exactly -- we are dealing with deficiency
25 in training in that results are not predictable because of

1 stress. My wife is trying to delineate the occasions of
2 that kind of stress.

3 MR. SWANSON: Mr. Chairman, would you prefer to
4 have all concerns so that the testimony -- ruled on at
5 once. Do you want to take it section by section?

6 CHAIRMAN SMITH: The first thing I would like to
7 do is to read it carefully. I have not done that. That is
8 my major problem right now. Then we will come back to
9 everybody's arguments on it.

10 (Pause.)

11 CHAIRMAN SMITH: Off the record.

12 (Discussion off the record.)

13 CHAIRMAN SMITH: All right, Mr. Swanson.

14 MR. SWANSON: As to the section referred to by
15 Licensee, the Staff also will object for largely the same
16 reasons cited. In reviewing this one final time we do not
17 see the words "testing" or "training" even mentioned in that
18 section.

19 I just do not see that there has even been an
20 attempt to link it up with the specific wording about
21 contentions.

22 CHAIRMAN SMITH: Okay. Well --

23 MR. BLAKE: I am sorry. I did want to observe for
24 the Board that this is not the only place where "fatigue"
25 appears in the prepared testimony. It appears, for example,

1 on page 3 in connection with the human factor elements, the
2 stressors, and therefore playing some role. That strikes me
3 as closer to what Mrs. Aamodt's contention was about, at
4 least as I now understand it through her cross examination
5 and questioning.

6 It is this section which I view as the operational
7 considerations. That is its direction. That is what the
8 last paragraph says.

9 CHAIRMAN SMITH: I did not hear.

10 MR. BLAKE: That is what the last section of the
11 paragraph is aimed at, attacking and making different
12 recommendations.

13 CHAIRMAN SMITH: I am not hearing you, Mr. Blake.

14 MR. BLAKE: Should I speak louder or --

15 CHAIRMAN SMITH: Louder and slower.

16 DR. JORDAN: Just like that.

17 MR. BLAKE: I wanted to point out that this is not
18 the only place in the testimony in which the concept or in
19 fact the word "fatigue" appears, nor have I objected to a
20 variety of cross examination questions by Mrs. Aamodt where
21 fatigue was tied to stressors or environmental conditions
22 which I now understand a good deal better to have been a
23 string in her bow.

24 CHAIRMAN SMITH: What?

25 MR. BLAKE: Now I understand her contention to

1 have involved this concept a good deal more clearly than I
2 did before. I have, however, drawn the line where she
3 attempted to attack operational considerations, the setting
4 of eight hours as the shift versus six or twelve or any
5 other number. And that is my understanding of the language
6 the Board earlier drew, and it is my view that this section
7 is directed at attacking an eight-hour shift and indeed the
8 rotational scheme of shifts, as opposed to tying it to her
9 contention as she does with fatigue in an earlier portion of
10 the testimony.

11 CHAIRMAN SMITH: Is there any place in the
12 testimony in this entire proceeding where the length of
13 shifts and the rotational systems are addressed?

14 MR. BLAKE: Is addressed?

15 CHAIRMAN SMITH: Right.

16 MR. BLAKE: We have had witnesses who address
17 shift rotation, and the eight-hour has been identified -- I
18 do not know that I can point you to a place where eight
19 hours has been justified by a scientist of one sort or
20 another.

21 CHAIRMAN SMITH: So when Mrs. Aamodt files her
22 proposed findings, she could very well point to that
23 testimony in support of her findings that the training does
24 not recognize -- take into account the reality of the
25 conditions for operation. I mean, she has an entire record

1 here of what the shifts are, what the shift revision is, and
2 she will be able to cite those.

3 MR. BLAKE: Indeed, she will be able to find
4 portions in the transcript where witnesses have talked about
5 shift rotation and in fact about training insofar as it
6 prepares one to cope with an eight-hour shift. That was the
7 purpose.

8 CHAIRMAN SMITH: Not only can she talk about that,
9 she can talk about anything she wishes to in proposed
10 findings. She can take the entire operation of that plant,
11 if she wishes, and cite it in her proposed findings. All
12 she has to do is just give us a transcript number, and that
13 is it.

14 MR. BLAKE: I --

15 CHAIRMAN SMITH: The point I am making is if we
16 have in evidence or if we reasonably can rely upon what she
17 has to say in the context of her general testimony, why not
18 permit it to be in so that at the very point -- at the very
19 place she is making her point, the record of the proceeding
20 is condensed and identified. Otherwise, she can do exactly
21 the same thing in proposed findings.

22 Now, I would approach it that we look at what she
23 has to say, and if it is accurately reflected as to what the
24 record demonstrates or if, for example, as in the case of
25 the Swain report -- the Swain report, if it is accurate, and

1 if it is an accurate quote from Circular 80-02. that she be
2 allowed to have it in this portion of the testimony so that
3 the points she is making are understood in context, because
4 she will be able to accomplish exactly the same thing by
5 citing to the record wherever these things might be found,
6 these points might be found.

7 Now, I have some trouble with portions of it, but
8 I am talking generally. As I read page 7, it seems to be a
9 fair representation of what the record of this proceeding
10 has already established. If there are any significant
11 errors in it, I think we ought to know about it.

12 Have we come to page 8 yet?

13 (Pause.)

14 Now, we recognize that Mrs. Ramodt's expertise and
15 contention is in the area of training and not nuclear plant
16 operation. We understand that. We are not accepting or
17 suggesting her testimony be accepted for the purpose of
18 demonstrating how the plant should be operated. But if she
19 has reliable information here in what others say and this
20 record is established, then to put her testimony in context
21 I think it should be accepted. I am talking about page 7.

22 MR. BLAKE: I do not know how reliable it is nor
23 how well it will stand up under cross examination if indeed
24 she is not an expert in this area.

25 CHAIRMAN SMITH: I know. We are not accepting her

1 as an expert on operational fatigue, shift rotation, length
2 of shift or anything else.

3 MR. BLAKE: I could not, for example, even locate
4 a Swain-Sandia Labs of 1-20-78.

5 CHAIRMAN SMITH: All right. That might be a basis
6 for either striking it after cross examination or striking
7 it initially. I do not know. I am just trying to address
8 the general idea.

9 THE WITNESS: I have that here with me, Mr.
10 Blake. It is a working paper of A.D. Swain, number 1223, of
11 Sandia Labs, dated 1-31-77 and revised 1-20-78. It is
12 called "The Effects of Hours on Job on Visual Detection and
13 Decisionmaking with Implications for Nuclear Power
14 Personnel."

15 I wanted to say that in my area of expertise I do
16 not put that -- I did studies in dialing while I worked for
17 the Bell Telephone Laboratories, and we introduced
18 stressors. We introduced --

19 CHAIRMAN SMITH: Wait a minute. We have to solve
20 this problem one step at a time.

21 THE WITNESS: Sure.

22 CHAIRMAN SMITH: In any event, would your
23 testimony satisfy your purposes if when you say these
24 conclusions -- that these and other references are evidently
25 drawn together in the I&E circular, if the I&E circular is a

1 part of your testimony, if we have to stop, go back and find
2 the site in the Sandia Labs report, I do not know what it is
3 going to add to your testimony.

4 You are depending upon the language from I&E
5 Circular 80-02, aren't you? So then won't you --

6 THE WITNESS: The question has not been, from what
7 I have read from the Sandia working paper, the question
8 hasn't -- I understand from speaking with NRC about this
9 during the discovery period that the question has never been
10 answered as to what is the optimum length of shift.

11 CHAIRMAN SMITH: You are missing the problem that
12 we have right now. You see, the problem we have right now,
13 Mr. Blake does not know if that is a correct statement or
14 not, and it seems to me that you summarized what everybody
15 says in language that we can ascertain is correct, and it
16 seems to me that that should solve your problem for your
17 testimony.

18 MR. AAMODT: Yes. And, Mr. Smith, I think I would
19 like to also point out that this is not to be construed as
20 an argument to hold with Metropolitan Edison on their length
21 of shift. We are concerned on whether these things impact
22 on the operators' ability to function after they have been
23 trained.

24 CHAIRMAN SMITH: This has been the thread of all
25 her cross examination -- the point has been made so well --

1 but I do not think there is any confusion likely to exist in
2 the Board's mind that she is simply laying what seems to be
3 a rather modest page and a half -- not even that --
4 predicate for her position that operator training deals
5 inadequately with fatigue.

6 MR. AAMODT: Yes.

7 CHAIRMAN SMITH: I have some problems with
8 something on page 8. Actually, when it boils right down to
9 it, it is just a single-page statement of what she feels is
10 the fatigue factor as to which training is inadequate, and
11 if it is unreliable for that limited purpose, it should be
12 brought in to place her testimony in context. By memory it
13 seems to be reliable.

14 (Pause.)

15 MR. BLAKE: Mr. Smith, I would like to propose a
16 middle ground between -- it may do it. My problem, quickly
17 looking down through seven and assuming that Mrs. Aamodt
18 will provide me with a copy of what I now understand to have
19 been a July document but revised in '78, I -- it may well be
20 that we could agree this is an accurate representation of
21 how shifts actually operate.

22 My problems are really going to come with the top
23 of page 8.

24 CHAIRMAN SMITH: All right.

25 MR. BLAKE: The top of page 8, if we get rid of

1 that it may be my problems go away.

2 CHAIRMAN SMITH: Now I want to go to page 8, but
3 first, page 7 had what I regarded as the evidentiary or the
4 record predicate for her testimony, and now page 8 is a
5 problem. So can we move on to page 8?

6 MR. BLAKE: Well, I plan to do more cross
7 examination on page 7 than my potential schedule for the
8 Board would have suggested I think at this juncture. But I
9 would like now to move to 8. Subject to that cross
10 examination I would remove my objection to page 7 subject to
11 renewing it later on, depending upon recross.

12 CHAIRMAN SMITH: Now, on page 8 the discussion --

13 THE WITNESS: May I speak, Mr. Smith?

14 CHAIRMAN SMITH: Yes, ma'am.

15 THE WITNESS: Mr. Smith, I think if we looked at
16 Attachment 4, perhaps my viewpoint on this contention could
17 be better represented.

18 CHAIRMAN SMITH: Wait a minute. We do not have --

19 THE WITNESS: Attachment 4 is a diagram.

20 CHAIRMAN SMITH: Yes. But we just have it back
21 from --

22 MR. BLAKE: Is Attachment 4 referenced on this
23 page 8?

24 THE WITNESS: It is not referenced on page 8, but
25 I was planning to use this originally just as an explanation

1 of why fatigue should be included under this contention; and
2 then I decided that it also fit in my discussion of what
3 really a man-machine interface is all about.

4 And I am perceiving it a little differently than
5 it has been perceived in this hearing in that most of the
6 attention of the man-machine interface has been on the
7 machine and not on the man, and it is really a
8 machine-machine interface. It is the trained crew machine
9 interfacing with the design nuclear machine, and I am
10 putting under all the things that modify or alter the
11 trained crew machine are listed under that area and are
12 comparable to the kinds of things that were considered in
13 the human engineering of the machine.

14 And so I view this contention in its true meaning
15 can be considered as a human engineering contention, human
16 engineering, the man-machine side of the man-machine
17 interface. And in reading the Essex Report, this was
18 acknowledged, that training was necessary, that engineering
19 of the man was necessary, but there was no address to it.
20 And I found that throughout the human engineering studies,
21 that aside from training, in a management sense there was no
22 addressing of the human engineering of the man part of a
23 man-machine interface.

24 And I am thinking of all the stressors we talked
25 about. We talked about stress, and when we have talked

1 about -- it is not the stress in testing or the stress in
2 training we are talking about but the stress in operations.
3 In the same way it is not the -- it is the fatigue in
4 operations. It is the number of changes in operation and
5 how they affect the trained crew.

6 CHAIRMAN SMITH: All right, Mrs. Aamodt. Please,
7 we are going to have to resolve the evidentiary problem
8 first. This is more of a technical nature. And then when
9 that happens, your view of your contention, that will come
10 out, I am sure. Well, it already has come out quite a bit,
11 but not our technical evidentiary objections to your
12 testimony which have to be resolved before we get into it.

13 Now, would you address your objections to the
14 language on page 8?

15 MR. BLAKE: Mr. Chairman, my objections there are
16 no different than the basis I previously provided. In
17 there, in my view, it is directly related to the operational
18 considerations and attacks --

19 CHAIRMAN SMITH: You have no different objection?

20 MR. BLAKE: I have no different objection to that
21 portion of it.

22 MR. AAMODT: Are we discussing the first
23 paragraph, Mr. Smith?

24 CHAIRMAN SMITH: First paragraph on page 8.

25 Okay. I would have imagined different objections.

1 MR. SWANSON: The Staff has a slightly different
2 objection. It appears as though that is based on a premise
3 which is contrary to the evidence in this proceeding, that
4 being the weekly change in sleep patterns caused by a weekly
5 shift rotation, which of course has been established by
6 Licensee testimony not to be the case; that there will be, I
7 believe, one week out of six or so where a normal sleep
8 pattern is altered.

9 CHAIRMAN SMITH: Well, I view it entirely
10 differently. I view it as two distinct parts. The opening
11 two paragraphs, one is an additional statement of fact.
12 Then we begin with Mrs. Aamodt's opinion. And I would have
13 challenged the statement, "There is strong evidence that
14 weekly revolving shifts disturbs sleep patterns, and crews
15 should be permanently assigned to a shift time."

16 If there has been such evidence in this
17 proceeding, it escaped me. I would have attacked that.
18 From there on in, her opinion, I would cross examine her as
19 to her expertise to make such an opinion. But it still --
20 if she has a reasonably concise descriptive statement of the
21 record of this proceeding to lay the foundation for her view
22 on training and fatigue, the Board thinks it should be
23 accepted; but I think she is going beyond that here on page
24 8.

25 MR. SWANSON: Well, I think that is the belief of

1 the Staff. However, I thought that perhaps we could find
2 out in cross examination what the basis was for her
3 statement, if it was her own personal testimony or she was
4 just recapping the record. If it is the latter, we would
5 object.

6 There are one or two other portions of the
7 testimony where we would have to ask questions to decide
8 whether or not there are areas objectionable to the staff.

9 CHAIRMAN SMITH: An appropriate ruling, references
10 to data on page 7, if accurate, are admissible for the
11 purpose of placing her testimony in context. Most of the
12 language on page 8 is her opinion. All of this is subject
13 to cross examination, but we are not going to simply bar the
14 subject matter of fatigue in operation simply because her
15 contention relates to training. The contention relating to
16 training, without a reference to what a person is trained
17 for, is half a contention and pointless.

18 So I think that that should be -- that will be the
19 Board's ruling.

20 I am sorry, Mr. Adler. We did not hear from you.

21 MR. ADLER: I have no comments.

22 CHAIRMAN SMITH: That is the Board's ruling.

23 MR. BLAKE: Mr. Chairman, the second basis for my
24 objection to that particular portion then in broader terms
25 of fatigue in general are related to whether or not it is

1 within the scope of the proceeding. And in fact, the only
2 specific studies that I could find of the subject of fatigue
3 was in the Essex Report.

4 It determined that fatigue played no role in the
5 accident, and I do not know whether or not the subject now,
6 particularly within the meaning of operational
7 considerations, and whether or not an eight-hour shift is
8 appropriate as the Board has now allowed this is within the
9 scope of this proceeding at all.

10 CHAIRMAN SMITH: Now, that is a point that I do
11 not think we have had put to us before.

12 MR. BLAKE: Yes, sir.

13 CHAIRMAN SMITH: Okay.

14 Mr. Aamodt or Mrs. Aamodt.

15 MR. BLAKE: I will provide for the record my
16 citation to the Essex Committee Report.

17 CHAIRMAN SMITH: I'm sorry. Would you state that
18 again?

19 MR. BLAKE: The citation for my reference to the
20 Essex Committee's report that no evidence at the time of the
21 accident, the actions or inactions of the operators were
22 significantly influenced by fatigue, disorientation, or
23 distractions, that is from NUREG-CR-1270, Volume I, entitled
24 "Human Factors Evaluation of Control Room Design and
25 Operator Performance at TMI-2," done by the Essex

1 Corporation for the Rogovin Committee.

2 THE WITNESS: I would like to address that first,
3 if I may, Norman.

4 MR. BLAKE: Just this before she speaks. Is this
5 in the nature of testimony or argument?

6 CHAIRMAN SMITH: It is not testimony. This is
7 argument.

8 THE WITNESS: How, Mr. Blake, did the Essex
9 Corporation, other than through opinion, rule that out?

10 MR. AAMODT: Margie, you might cite the
11 qualifications of the people at the Essex Corporation who
12 did the study, too.

13 THE WITNESS: I do not want to make an evaluation
14 of the Essex Corporation.

15 MR. BLAKE: I am aware of no contrary evidence.

16 THE WITNESS: I would like to know what did they
17 back up that conclusion with. They are supposed to be a
18 scientific organization.

19 CHAIRMAN SMITH: Wait a minute. We are headed off
20 into an impermissible area here. Why do you believe that
21 training for crew fatigue has a relationship to the accident
22 at TMI-2?

23 THE WITNESS: It happened in the back shift,
24 number one. It happened toward the end of the back shift.
25 These are just circumstantial evidences but no more than --

1 I can draw my opinions just like the Essex Corporation can
2 draw their opinions.

3 And it is then the fact that Met Ed was working
4 their crews -- work having a great deal of overtime -- and
5 the Rogovin Report states that whatever caused the crew not
6 to be able to see what was the problem and to make so many
7 errors in the course of events after the onset of the
8 initial events will probably forever remain a mystery.

9 And so to rule out that fatigue could not have
10 contributed to this accident is to me believing that you
11 have more information than you do, and the hunches that I
12 get as a scientist indicate otherwise.

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1 CHAIRMAN SMITH: So it is going to be, then, the
2 record basis that you will have will be as a professional in
3 this field, that the inference can be drawn from the fact
4 that it was in the backshift.

5 MR. BLAKE: I quite frankly do not see how her
6 testimony goes to the backshift, or that we should not have
7 backshifts at all. And I would also point out in the course
8 of the discovery phase, Mrs. Aamodt asked questions and in
9 fact, the Board required we answer questions about the
10 operators and how long they had been on duty at the time of
11 the accident. We responded that they had been on for four
12 hours at the time of the accident, and there is no evidence
13 that I am aware of that these operators worked long hours or
14 overtime hours as Mrs. Aamodt has just suggested.

15 CHAIRMAN SMITH: How about in the handling -- that
16 is a different matter, the performance following the
17 accident.

18 MR. BLAKE: How about in the performance following
19 the accident?

20 CHAIRMAN SMITH: Yes, was fatigue pointed to by
21 any of the writers on the subject as being a contributor to
22 the handling of the accident?

23 MR. BLAKE: No, this was the only thing that I
24 could find on the subject of fatigue, and I am unaware of
25 any contrary evidence that suggests that fatigue played a

1 role in this accident.

2 THE WITNESS: Mr. Blake points out how little it
3 has been examined, but in examining one of the NEC documents
4 on analysis of errors made at nuclear power plants -- and I
5 believe it was cited in one of the Commission's -- Committee
6 studies that there are significantly more errors made at the
7 ends of shifts and beginnings of shifts, so that both
8 fatigue and change are important in errors.

9 CHAIRMAN SMITH: Okay.

10 Well, here, this may be where we end up.
11 Certainly the testimony has to have a relationship to the
12 accident and to the scope of the proceeding. If we reject
13 that portion of Mrs. Amodt's testimony and she later cites
14 in proposed findings record evidence that fatigue was a
15 contributor to the accident or to the allegation that the
16 performance following the accident was inadequate, then I
17 really would have been wrong, although I do think right now
18 it is her responsibility to point to some record basis for
19 it being within the scope of the proceeding.

20 In that event, the testimony, which would be
21 stricken by an order now, would be properly before the
22 Commission or before the Board. If we receive it now and
23 she does not substantiate fatigue as being related to the
24 accident, then the testimony cannot very well be a basis for
25 findings by the Board.

1 So I do not see how we can make a mistake one way
2 or the other. The way it is going to turn out is she is
3 either going to have to establish it being within the scope
4 of the proceeding, that fatigue has a relationship to the
5 accident --

6 MR. SWANSON: Mr. Chairman, I might just point one
7 thing out which I think should be mentioned on the record,
8 that the length of shift was included among the requirements
9 in NUREG-0694, which is entitled TMI-Related Requirements
10 for New Operating License.

11 So although I am not prepared to argue that point
12 right now, apparently the staff has taken the position that
13 it was relevant enough to be included in that document. I
14 think my argument would go more towards the relationship to
15 her Contention. I understand that has been ruled on.

16 CHAIRMAN SMITH: Okay.

17 As far as the Contention is concerned, if there is
18 a reasonable basis for Mrs. Aamodt to argue or propose in
19 her findings that training should take fatigue into account,
20 then we will have to consider her testimony on that
21 subject. Even if we strike the testimony, it remains in the
22 record as being in the category of rejected documents. It
23 remains in the record. I just do not think we can make a
24 mistake. Whichever way we go, it comes out all right. I
25 think that you had better cross examine on it, and I think

1 that the better approach for us is to accept it subject to a
2 demonstration by Mrs. Aamodt that fatigue was a contributor
3 to the accident. Otherwise it would be outside the scope of
4 the proceeding and outside of our jurisdiction to consider
5 it.

6 So that would be our ruling.

7 MR. AAMODT: Mr. Smith, I don't mean to belabor
8 it, but it might be important. You mentioned the nexus, if
9 that is the word, to the accident. The Board's order is
10 that training be upgraded so that the plant can run safely.
11 What we are concerned about here --

12 CHAIRMAN SMITH: The Commission's order.

13 MR. AAMODT: The Commission's order. It would
14 seem to me what we are concerned about here is the broader
15 scope of that question: can the plant be operated safely?
16 And if something should develop that did not happen at the
17 Unit 2 accident but could likely be demonstrated to be
18 potentially a cause of another accident that relates to
19 training, would it not then reasonably be --

20 CHAIRMAN SMITH: No, sir, that has not been well
21 understood by many people in this proceeding. We are not
22 permitted to make a general inquiry into better ways to
23 operate TMI 1.

24 MR. AAMODT: I realize that, general -- but the
25 training specifically --

1 CHAIRMAN SMITH: No, the training parts of the
2 order were quite specific as to what training is required,
3 and they do not -- I recall nothing in there that goes
4 beyond the nexus to the accident, nor taking even if it were
5 imprecise along that line, you have to take it in the
6 context of the entire order.

7 Furthermore, the Commission has expressly stated
8 that Contentions must have a reasonable nexus to the
9 accident.

10 MR. AAMODT: I would like to submit there is one
11 reasonable nexus, and that is in the Rogovin Report where
12 the pressure relief valve was closed, the people who wrote
13 that made the point that a half hour after -- I am sorry. I
14 was not prepared to go into real detail on this, but a half
15 hour after someone new arrived at the shift, he all of a
16 sudden diagnosed the problem, and he made the point how come
17 here, someone came just a half hour and he recognized it,
18 and there is an inference there relative to fatigue.

19 CHAIRMAN SMITH: Okay. That is fine. That is the
20 type of thing -- now, we cannot give you a quantity of --

21 MR. AAMODT: I am sorry.

22 CHAIRMAN SMITH: I cannot tell you how much record
23 support Mrs. Aamodt must provide before she demonstrates the
24 relevance of fatigue in her training program, that it would
25 just be meaningless. I mean even if her arguments are the

1 most eloquent possible and they convince the board that
2 fatigue should be addressed, there is not much we can do
3 about that if we do not -- if it does not come within the
4 jurisdiction of the Board. We are not sent out to improve
5 nuclear reactors in general, just to look at this accident.

6 Okay, but that will be our ruling. That is our
7 ruling.

8 MR. BLAKE: Mr. Smith, my next comment went to the
9 admissibility of the proposed attachments.

10 CHAIRMAN SMITH: All right.

11 MR. BLAKE: Which I have not seen heretofore, with
12 the exception of the newspaper clipping which I was not
13 prepared to object to. I have not had an opportunity to
14 look at the other attachments.

15 I do recognize at least one page of circular
16 80-02, but I do not know about Attachments 2 --

17 CHAIRMAN SMITH: Attachment 2 was prepared by Mrs.
18 Aamodt and can be considered the same as testimony.

19 Now, your objection could be that you have not had
20 any warning.

21 Was Attachment 2 prepared by you?

22 THE WITNESS: Mr. Smith, I have to say I can
23 hardly hear here, and I wish, if there is anything that can
24 be done -- I have not been able to hear a word Mr. Swanson
25 said, and I missed completely what you said now. I just am

1 not able to hear.

2 CHAIRMAN SMITH: Well, let's take our break.

3 Mr. Blake, we propose you use the break to review
4 the attachments to see if it solves any of your problems
5 with them. It does seem to me -- can't you hear me at all,
6 Mrs. Aamodt?

7 THE WITNESS: Very poorly.

8 CHAIRMAN SMITH: I do not know what to do about
9 that. We have been struggling with the problem ever since
10 the hearing began. You heard me out there. You can go back
11 to your seat and testify.

12 THE WITNESS: Do you think if I moved over one,
13 could you hear me better?

14 CHAIRMAN SMITH: I do not know. You are the first
15 witness who has had trouble hearing me from there. I have
16 no explanation for it.

17 THE WITNESS: I don't think I heard half the words
18 you just said then. Maybe I had better go back to my seat.

19 MR. AAMODT: Marge is very unusual.

20 DR. LITTLE: At times one of the side speakers is
21 not turned up sufficiently. It may be we could solve the
22 problem by increasing the volume on this.

23 Does anyone else notice it is lower today, or does
24 it sound the same?

25 THE WITNESS: You are hearing all right?

1 CHAIRMAN SMITH: I think -- take your seat at the
2 table. That way Mr. Amott will be there to help you and it
3 will be just as good as being at the witness stand.

4 (A brief recess was taken.)

5 CHAIRMAN SMITH: Mr. Blake, we had asked you
6 review these attachments during the break to see if your
7 objections, or I guess it is more reservation than objection
8 --

9 MR. BLAKE: I am not prepared to object to them.
10 I do not quite frankly understand a couple of the
11 attachments. It may be on additional direct I will, and it
12 may be that once I do I will need to touch base with either
13 Dr. Gardner or Dr. Christensen or somebody else. I just
14 don't know at this point, Mr. Smith.

15 CHAIRMAN SMITH: What you are doing is you are
16 reserving your right to object.

17 MR. BLAKE: That is all.

18 CHAIRMAN SMITH: All right, okay.

19 Do you understand then, the Board's ruling is that
20 we will permit the testimony under the subject matter
21 beginning on page 7, "Another stresser, fatigue," to remain
22 in. However, it cannot be used, it is the finding of the
23 board, absent the demonstration that fatigue was causally
24 related to either the accident or the performance following
25 the accident.

1 I am going to keep this copy until the end of the
2 testimony. I think that I have one which is suitable for
3 the reporter.

4 MR. AAMODT: I may mark this and use this?

5 CHAIRMAN SMITH: Yes.

6 (Whereupon, the prepared direct testimony of
7 Marjorie Aamodt, and attachments thereto, follow:)

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L44-17
2/17/81

February 2, 1981

United States of America
Nuclear Regulatory Commission

Before the Atomic Safety and Licensing Board

| | | |
|-----------------------------|---|----------------------|
| In the Matter of | O | |
| Metropolitan Edison Company | C | Locket No. 50-289 SF |
| (Three Mile Island Nuclear | O | (Restart) |
| Station, Unit 1) | C | |

Intervenor Marjorie Aamodt's
~~and Herman Aamodt's~~
Testimony

and

~~Plan of Cross-examination~~

Regarding Aamodt Contention No. 2

Control Room Operator Training
and Testing

Marjorie Aamodt

Study (of the Licensee's Operators Accelerated Requalification Program, the report of the Licensee's Review Committee of the OARP, the report of the Licensee's review committee on the Unit 1 control room from a human-factors view, and NUREG 0660, 0680, and 0737,) has not *believed* the concern expressed in Aamodt Contention No. 2 regarding performance of control room personnel.

The Task Force of "Lessons Learned", NUREG 0585, stated that operational safety merits paramount attention by NRC as a result of the accident at TMI. Human error figured significantly in the escalation of a minor incident at TMI Unit 2 into a major accident.

Aamodt Contention No. 2, therefore, states:

It is contended that TMI-1 should not open until the performance of licensee technicians and management can be demonstrated to be upgraded as certified by an independent engineering firm. This upgrading should include 100% test performance of job description with provision for retraining and retest, or discharge of those who cannot consistently and confidently master all necessary information for safe conduct of their job description under all anticipated critical situations as well as routine situations.

of the OARP
The review committee is evidently to be construed as an independent engineering firm in the context of the contention. Therefore considerable attention has been focused by this intervenor on their report in an effort to satisfy concerns expressed in the contention.

The committee, in its conclusions, has approved the Licensee's OARP and is of the opinion that the personnel will perform well on NRC examinations to be given later this year.

The MetEd personnel engaged in the retraining program had, for the most part, already passed NRC licensing examinations with higher scores than the national average. Use of the NRC exam, although it is purportedly to include additional material (the TMI accident and thermodynamics) and grading will be somewhat more stringent, does not qualify as a reliable measure of prediction of performance.

IN view of the TMI-2 accident

The wording of the contention, "certified by an independent engineering firm" also meant "independent" of the NRC criteria.

Test performance was contended to be 100% of job or task description, not of any test of material presented. The latter is more equivalent to an intelligence test; what was intended was a test to determine if the operator can perform all tasks that will come in his bailiwick under varying conditions of stress. Since task descriptions are not adequate according to the review committee, it cannot be known with certainty that they can be fully executed (100%).

Intervenor has turned, therefore, to examining the documents listed above as they relate to training and testing, ^{and} their possible but ~~unknown~~ effects on performance of control room operators.

UN Measured

Man (Trained)--Machine (Human-engineered) Interface

Every operation instituted by man since the invention of the wheel requires some combination of man and machine interface. Human resources, including training, are exhausted through incompatibility between man and machine.

Considerable attention has been given in this hearing to the design, or retrofitting of the physical environment of control room to suit human characteristics, presumably to optimize accurate receptance of visual, audible and sensory stimuli, their interpretation and reliable responses. A number of changes in the control room design and environment have been suggested according to principles that have been known for perhaps twenty or thirty years, and used in other industries (notably aviation, production lines, telephone).

The review committee has recommended retrofitting the control room of Unit 1 to incorporate changes deduced from presently-known engineering principles. The committee considers some of these changes as needed prior to restart, however others are not considered crucial to plant safety or reliability. They are (p. 24):

- a. a means of dehumidifying incoming air to eliminate excessive dryness in cold weather, and a means to improve air filtration during normal operation,
- b. light baffles or other means, to reduce glare on the console from overhead lighting,
- c. * carpeting to reduce noise (to a level such that the day shift ambient is approximately equal to present night shift ambient), to reduce glare, and to reduce operator fatigue,

- d. a rigorous, preplanned approach to inspecting, adjusting (for intensity) and replacing light bulbs for console and panel devices, and
- e. revised audible intensities for alarm annunciators to levels uniformly intelligible to the operator.

The first three are of particular concern because they bear directly on operator fatigue, a subject which is completely neglected in the reviews of both the OARF and control room design. Although the machine can be made very reliable in terms of its suitability to the generally known characteristics of man, the man in the control room is, in a sense, a more complicated machine than the nuclear power plant, and needs to be 'engineered' to interface with that machine. In a sense, it is a Machine (man) -- Machine (plant) interface. * To not correct any factors in the 'simple' machine, which ^{can} seriously fatigue the complicated machine (man), would be an error.

The report, in referring to the environmental changes suggested above, states:

"None of the above is considered crucial to plant safety or reliability, but their implementation would be expected to improve operator alertness and morale."

It would seem that all known changes in the control room that would have a positive impact on operator performance should be retrofitted prior to restart, particularly those changes that would reduce fatigue, since the negative effect of fatigue on performance has been clearly demonstrated in many studies.

Some of the human engineering recommendations have been perceived as too extensive and expensive, and, therefore, may prevent rapid return of Unit 1 to service; this kind of thinking evidenced in the committee's review (p. 92) appears improper and reflects a lack of independence of the reviewers from the interests of the licensee who engaged their services. It would seem that the experts' assignment was to decide, according to their expertise what changes in the control room are needed to assure safe operation -- and that is all.

* Attachment 4

Returning Unit 1 to service prior to engineering of the control room to the 'best' human-engineering standards presently know would negate the desired effects of upgrading training. Instituting changes after restart would present a source of confusion and resultant error comparable to the undesirable effects of training on a simulator that is not an exact replica. Operators expressed dissatisfaction during training in the OAKI that more changes would be made that would invalidate their training. This kind of procedure not only erodes morale, but confusion can result in the control room, particularly under stressful conditions such as fatigue, boredom or emergencies.

Training on Simulator that is not an exact replica

The review committee, as well as the licensee, foresees the need of an exact replica simulator of Units 1 and 2 as a long range plan. Negative effects on training are recognized in the use of the B&W simulator at Lynchburg, Va. since it is not an exact replica of the TMI control rooms. Additionally, the licensee's use of a simulator for training falls far short of the number of hours recommended by the ~~Oak Ridge~~ ^{TVA} Laboratories as well as the review committee.

Pennsylvania Power and Light Co. (Attached) ^{next 2} has built a simulator to train operators for their Luzerne County plant that will not go on line until 1962. Since its inception, use of the simulator has detected errors in design so that construction can be corrected prior to commissioning. It is expected that this simulator will provide a mechanism for training operators in the real universe of plant operating parameters. An operator in training at Luzerne commented, "bests reading about it in a book," or, it might be aided, told about 'it' by an instructor in a classroom situation.

Philadelphia Electric also has a replica, although not exact, for its Limerick plant prior to licensing.

If a simulator was built for TMI that incorporated the design changes recommended by the various committees,

- a. the final design of both Unit 1 and 2 control rooms could be optimized through trial and error,
- b. training would be superior to that now available and in line with the strong recommendations of ~~Oak Ridge~~ ^{TVA} and others

TVA

- c. tasks could be analyzed and required abilities identified, a serious deficit in the training and testing program presently,
- d. personnel could be *tested* by demonstration of ability and training through performance on the simulator, which would be more predictive testing than currently available or through possible analyses of *Program and references*,

Concept of Accreditation Employed in Evaluating OARF

The Review Committee engaged by the licensee to study the OARF was directed to apply standards used to accredit engineering schools. The Accreditation Board for Engineering and Technology methods were generally applied. The conclusion of the committee on p. 3 does not appear to follow from their analysis. Their conclusion was

that the Operator Accelerated Training program carried out by Metropolitan Edison was a high-quality, well-executed program, having many of the features which should be incorporated into the regular Operator Retraining program."

The following detractions to the committee's conclusion were taken from the review and would appear to be major faults under aspects considered by an engineering accrediting board:

- a. Facilities: trailers inadequate and not conducive to learning; the simulator at Lynchburg, Va not an exact replica,
- b. Faculty: many non-degreed instructors with an average level of higher education of 3 years and an average of 4 Years experience in either the nuclear industry or armed services; several had not passed NRC licensing,
- c. Teaching Format: Formulated by instructors according to guidelines provided; taught in eight hour sessions which students found fatiguing; no homework,
- d. Materials: need improvement; Task replicas needed.
- e. Content: review material except for addition of course work in thermodynamics and heat transfer, and week-long course in Decision Analysis. Although thermodynamics course in engineering school would be approximately 60 hours per semester, OARF included only 16 hours.

The review claims that the program was consistent with good pedagogical principles, however on p. 52, "Both students and instructors indicated the amount of material covered was very extensive and difficult

* Attachment 2

to absorb in the time allotted."

Although, the participants were "coached" in passing the licensee's examinations, which were described as mock NRC exams, a number of NRC licensed operators failed on their initial attempt. This was puzzling in that weekly quiz scores were high.

"Coaching" for the exams was done by a former NRC test constructor and examiner. Although the Licensee exams, as well as the NRC exams, are purported to be upgraded, as are requirements for passing, coaching may artificially raise grades without raising ability.

Stress:

The review committee considered the effect that conditions that are perceived as forerunners to an emergency may have on the ability of the operators to perform adequately. Since creating real emergencies is not possible, the use of the B&W simulator to run crews through various scenarios that could escalate into an 'emergency' was considered to be as stressful as the real situation. That is doubtful, since all involved are aware that the consequences of incorrect actions would be retaining, or, at the most, dismissal.

Since the entire world's eyes have been focused on TMI for nearly two years, the level of stress that could result, if unexpected events occurred, is impossible to simulate.

The effects of severe stress on those who are making decisions they have never made before, and whose outcome may mean life or death, are impossible to predict. Added, to the psychological stress of emergency conditions, are the stressors of additional signals, the newly-created need to communicate with emergency units, and the still possible need to seek other technical resources.

There is no way to know whether the trouble shooting ability of technical advisors, the dubious increase in technical knowledge gained by the operators through the OAKB, and the rather limited training in Decision Analysis would be sufficient to overcome a really tough critical situation.

Another Stressor, Fatigue

An additional environmental stressor that has been demonstrated to effect performance is physical and mental fatigue of the operator. Neither licensee nor review committees have considered the suitability of length of shift, or the effects of time of shift on the performance of control room personnel. (The review committee has questioned the advisability of a weekly shift rotation.)

Licensee has opted for an eight hour shift with reasoning based on tradition, however the schedules of hours worked by TMI Unit 1 and 2 personnel reveal schedules that exceeded eight hour days and forty hour weeks.

NRC designated an eight hour shift as normal duration in answer to question 21, about 6th Set of interrogatories, however, in a circular to licensees, dated Feb 1, 1980, ^{as well as in letter to licensees July 31, 1980} outlined overtime policy to allow as many as 12 hours on duty and a 72 hour work week. *

IE 80-02 *

Besides other features of control room working conditions, that may be more widely known, the operators essentially remain on duty for the entire shift, even eating their lunches in the control room.

There are no studies made directly on the effect of fatigue on nuclear power plant operators' performance, however some references to laboratory studies in other work situations were drawn together by Swain, Scandiff, 1/20/78. These and other references are evidently drawn together in the following summary in Circular No. 80-02, February 1, 1980 from the NRC Office of Inspection and Enforcement addressing Nuclear Power Plant Staff work Hours:

|| Studies indicate that with fatigue, especially because of loss of sleep, an individual's detection of visual signals deteriorates markedly, the time it takes for a person to make a decision increases and more errors are made, and reading rates decrease. Other studies show that fatigue results in personnel ignoring some signals because they develop their own subjective standards as to what is important, and as they become more fatigued they ignore more signals. ||

The proper length of shift needs to be decided on the basis of measuring performance of routine and decision-making tasks under varying conditions of fatigue. Until the proper length of shift for optimum operator performance can be decided, it would be better to err on the side of caution, or Navy tradition. The Navy shift of six hours appears to have worked for them. } NOT a quote

* Attachment 3

as prepared by Licensee

There is strong evidence that weekly revolving shifts disturb sleep patterns, and that crews should be permanently assigned to a shift time. A six-hour shift with four shifts assigned to a time of day and two shifts assigned to a combination of 'relief, study and off-duty,' should be considered. Rotation to 'off-duty, study, relief' or to a different time of shift at a three month interval would appear to disturb sleep patterns less. If six hour shifts were 6-12, 12-6, 6-12 and 12-6, three-quarters of the on-duty personnel would be able to sleep at traditional times, *considered effective in reducing fatigue.*

Evidently there are union considerations regarding length of shift and overtime, however these considerations should not take precedence over safety considerations.

Attitudes Conducive to Optimal Performance

Attitudes can override adequate training. The review committee refers to the safety record of the nuclear Navy and the discipline that the residence of the officers as well as 'presence' of Commander Rickover afforded. Short of hiring Rickover as head of Met Ed, the attitude of the operators about their responsibility to the public and their perception of the hazards of nuclear power should be assessed and adjusted through appropriate instruction. In answer to an interrogatory, Amendment Sixth Set, the NRC responded that the only indication to the operator of his responsibility for the health and safety of the surrounding public was the wording on his license, and whatever was given by the utility. ~~Subsequently, April 30, 1980, NRC sent a letter indicating that Harold Denton had begun such a program i.e. speaking with operators about their responsibilities to the public at large -- on a trial basis.~~

The review committee expresses concern relative to personnel morale in view of additional licensing requirements, delays in restart, addition of technical advisors and possible changes in promotional qualifications. While each individual has basic instincts for self-gratification, the higher requirement of public safety should be emphasized with each person in the employ of TMI Unit 1. There should be screening of potential operator candidates, as well as those already hired, to predict or detect dissatisfaction which could erode performance; means to foster morale, respect for the investment of the Met Ed stockholders and deep concern for the adverse effects on

health of low-level radiation as well as the potential for major accidents, should be explored and developed to optimize ^{responsibility in using} training ~~and~~ performance.

Need for Psychologists on NRC and Licensee Staffs

No psychologist was included on the panel of the Kemeny commission or to my knowledge ^{or} any other major commission. Perhaps more would have been learned about the accident.

It appears that Eric Gardiner is the first experimental psychologist employed by Met Ed to assist in their training and testing program-- and Julien Christensen, the first human engineer.

NRC has evidently employed the services of psychologists and human engineers through special contracts, however there appear to be no personnel on the NRC staff with professional qualifications in personality assessment, learning, test construction or human engineering. The nuclear industry and the NRC appear far behind others in this regard. Presently Licensee and NRC testing of operators is in the academic tradition, that is, measurement of retention after teaching. Task analysis for each position in the control room needs to be done. Tests need to be devised that reliably predict adequacy of performance. The present promotional system needs to be studied and requirements established that reflect required abilities and skills suited to each job. What is needed is psychological engineering of the man-role.

NRC and Met Ed should consider the establishment of psychology departments to perform the many measurements and observations needed to reduce human errors.

Conclusion

There ~~are~~ ^{are} no valid reasons for assurance that the performance of the control room operators has been upgraded so that safe conduct of their job description under all anticipated critical situations as well as routine situations can be reliably predicted.,

Qualifications of Marjorie Aamodt:

BS degree, Rutgers University, Experimental Psychology, 1949
MS degree, Brown University, Experimental Psychology, 1951
Assistantship Psychology Department, Brown University 1949-50
Assistantship Pembroke College, 1950-51
Experimental Psychologist, Bell Telephone Laboratories 1951-1956
Teacher, Coatesville Area School District 1967-68
Managed Farm Business 1964-1969
Former member American Psychological Association
Study - All numeral dialing for AT&T switchover to Direct Dialing
Study - Operator Errors, Defense early warning System
Study - Extinction of Learned Responses inversely related to Effort

Qualifications of Norman Aamodt:

MS degree, Stevens Institute of Technology, 1951
1951-1952 Ingersoll Rand, employed as mechanical engineer
1952-1962 Bell Telephone Laboratories, Member of Technical Staff
1962-1969 Consultant to Avisun Corp., Sterling Extruder, several
other corporations and businesses.
1968-1969 Mathematics instructor, Lincoln University, Oxford, Pa.
1970-1978 Farm Business
1978-present President, hardware company
1976 Consultant, University City Science Center

Held membership in following:

American Society of Mechanical Engineers
The Society of Elastic Engineers
The Wire Association
ASTM - American Society for Testing Materials
Devised method in use by Bell System to damp
vibrations in cables; wrench currently in manufacture, patented.
Pioneered farming method using minimal petrochemical fertilizers.
1952-55, Communications Development Training Program, Bell labs
Staff and NYU

PP&L Builds \$6 Million 'Trainer' To Prevent Nuclear Accidents

By TIM MEKEEL
New Era Staff Writer

BERWICK — The PP&L nuclear power plant here won't be switched on for several years, but ready it has had a couple of three Mile Island-like accidents. That is, make-believe accidents.

Thanks to a \$6 million computerized simulator, the plant's future operators are learning how to cope with a myriad of potential incidents, from the routine to the exotic, including the type of accident that crippled the Three Mile Island plant in 1979.

The sessions are pretend; the learning is real.

"It's probably the best \$6 mil-

lion the company ever spent," said Eugene R. Carlson, simulator supervisor at Pennsylvania Power & Light Co.'s Luzerne County plant.

The unique space-age simulator is an exact replica of the Susquehanna Steam Electric Station control room. PP&L is one of a handful of utilities in the country to have its own simulator. It enables 55 trainees, taking their turns at the simulator's array of knobs, dials and screens, to get invaluable hands-on experience.

"Beats reading about it in a book," said one student.

Behind a double-lock door, sessions start with an instructor picking one of 26 plant conditions,

ranging from cold shutdown to full power. Then the fun begins. The instructor can select any number of 17 malfunctions, in any order, from 225 possibilities. To confuse matters, he can throw in some of 1,580 false alarms.

"The more you give them, the more they like it," said Carlson. "They like to be challenged."

As a teaching aid, the simulator has more moves than Reddy Kilowatt.

The evolving plant conditions can be speeded up or slowed down by a factor of 10. That way students don't wait hours for a "turbine" to cool, for instance.

Conditions can be "frozen."

Bill Lowthert checks out the control room simulator at PP&L's Susquehanna nuclear plant near Berwick, Luzerne County. Lowthert, 31, of Bloomsburg, is plant training supervisor.

allowing the teacher to stop the action. Or he could take a "snapshot." This files away a specific moment for future use, for example, when a class comes back from lunch. And there's a

—See SIMULATOR—Page 4

Simulator Prepares PP&L Nuclear Staff

(Continued from Page One)

"set-back" feature which reverse or backs up the activity, a few minutes.

"If the plant 'dumps' (stops generating), you can run through it again" and find out what an operator could have, or should have, done to prevent the shutdown, said Gary Merrill, 27, an instructor from Beach Haven, Luzerne County.

Though the \$3.1 billion plant's Unit 1 won't go into service until 1982, the simulator earned its keep almost immediately. Carlson noted that simulations have revealed four "major design problems" that "would have impacted the plant's availability significantly."

"They were in a circulating water system, a main steamline isolation valve testing sequence, a low-pressure coolant injection safety system and a reactor protection system.

After the plant is generating power, Carlson said operators will spend one week out of six in simulator training.

Working in a control room can be very boring. It should be, if all is going smoothly; the 33-year-old Bloomsburg supervisor said. But that can lead to stale skills.

The brush-up work is not a requirement of the federal Nuclear Regulatory Commission, which oversees nuclear utilities. Neither is the simulator itself. Both are musts, however, in the thorough attitude of Carlson, a quick-thinker who seems absorbed in his work.

That value on being prepared goes back to PP&L's choice of a control room layout in the early 1970s.

The standard style of a control room has operators standing among a lengthy row of meters and dials. The contemporary style has operators seated at a console, controls at the fingertips.

PP&L opted for a blend.

The Susquehanna control room uses a stand-up but compact design created for them by General Electric Co. and Bechtel Power Corp.

What grabs a visitor's attention is a row of 10 television screens. Here's where the concise design comes in. Each 19-by-19 inch screen can show a five-color diagram of any of 10 plant systems, such as the turbine, generator or control rods.

On the screen are about 15 numbers, telling items like temperatures and fluid levels at a glance. This digital readout is updated four times a second, so the operator is instantly aware of any change in the system.

And the operator doesn't have to look all over the room for a crucial dial. It's all in front of him, color-coded to warn of a dangerous development. If a condition turns sour, the number becomes red.

"Even if you've done it for years, you still can walk up to a meter and pick off the wrong number. Then you make a bad decision," said instructor Merrill.

The screens also provide a visual look at a system. The water level in the reactor vessel, a vital item, is illustrated in a simplistic cutaway sketch. When back-up meters show the water level changing, the visual shows it doing the same, as do the numbers on that same screen.

The only thing that's missing is the sound of water gurgling.

Computer-generated graphics make the simulator and control room a one-of-a-kind combination.

Traditionally, a utility sends its personnel to the equipment manufacturer to learn on its simulator, according to William D. Begin, plant public information director.

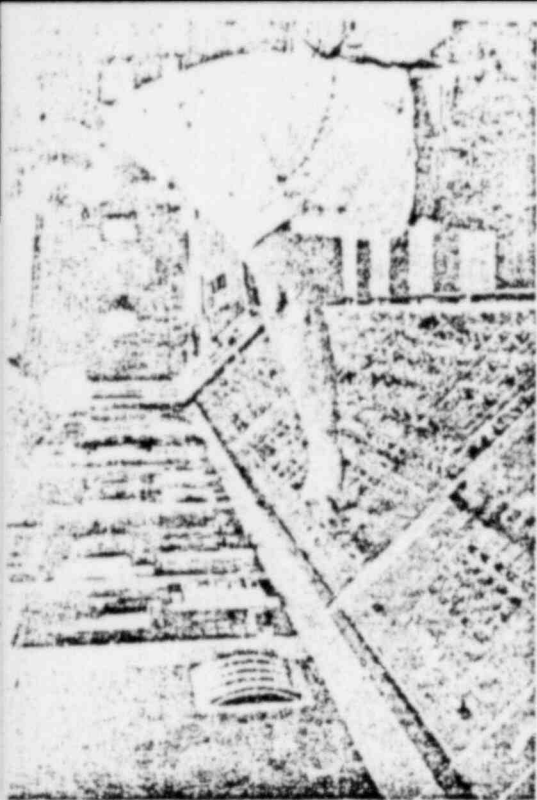
But there was no simulator resembling this PP&L hybrid. Thus the special simulator, something Capt. James Kirk of "Star Trek" would seem at home using, became necessary.

With a staff of eight instructors, Carlson is gearing the training program for NRC licensing exams in April 1981. Thirty-five of the 55 students must pass to adequately staff the 1,050 megawatt Unit 1.

The impending exam seems grueling. It's expected to include an eight-hour written test, a four-hour oral test, a four-hour plant walk-through test plus a three-hour test on the simulator.

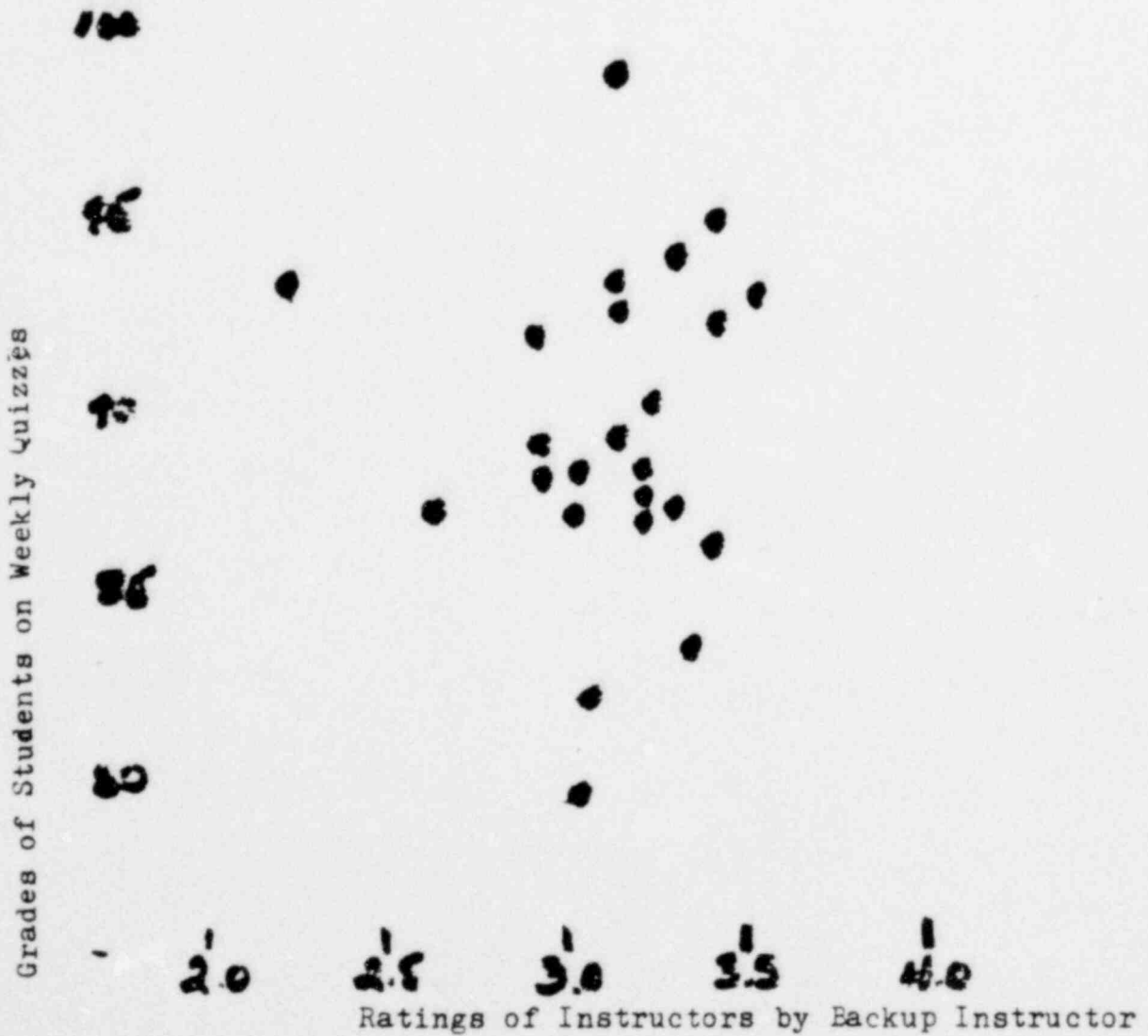
Carlson said the typical trainee is a high school graduate in his early 30s, married with children and from a small town.

If they become a licensed reactor operator, they'll draw a salary around \$27,000, Carlson said. A senior operator can figure on a salary of about \$35,000.



This plot demonstrates that there was no definable relationship between the two variables (instructor ratings and quiz grades) plotted below.

OARP QUIZ RESULTS AS A FUNCTION OF INSTRUCTOR RATINGS



Attachment 3

ENCLOSURE 1

SSINS No.: 6830
Accession No.:
7912190657

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

IE Circular No. 80-02
Date: February 1, 1980
Page 1 of 2

NUCLEAR POWER PLANT STAFF WORK HOURS

Description of Circumstances:

Studies indicate that with fatigue, especially because of loss of sleep, an individual's detection of visual signals deteriorates markedly, the time it takes for a person to make a decision increases and more errors are made, and reading rates decrease. Other studies show that fatigue results in personnel ignoring some signals because they develop their own subjective standards as to what is important, and as they become more fatigued they ignore more signals.

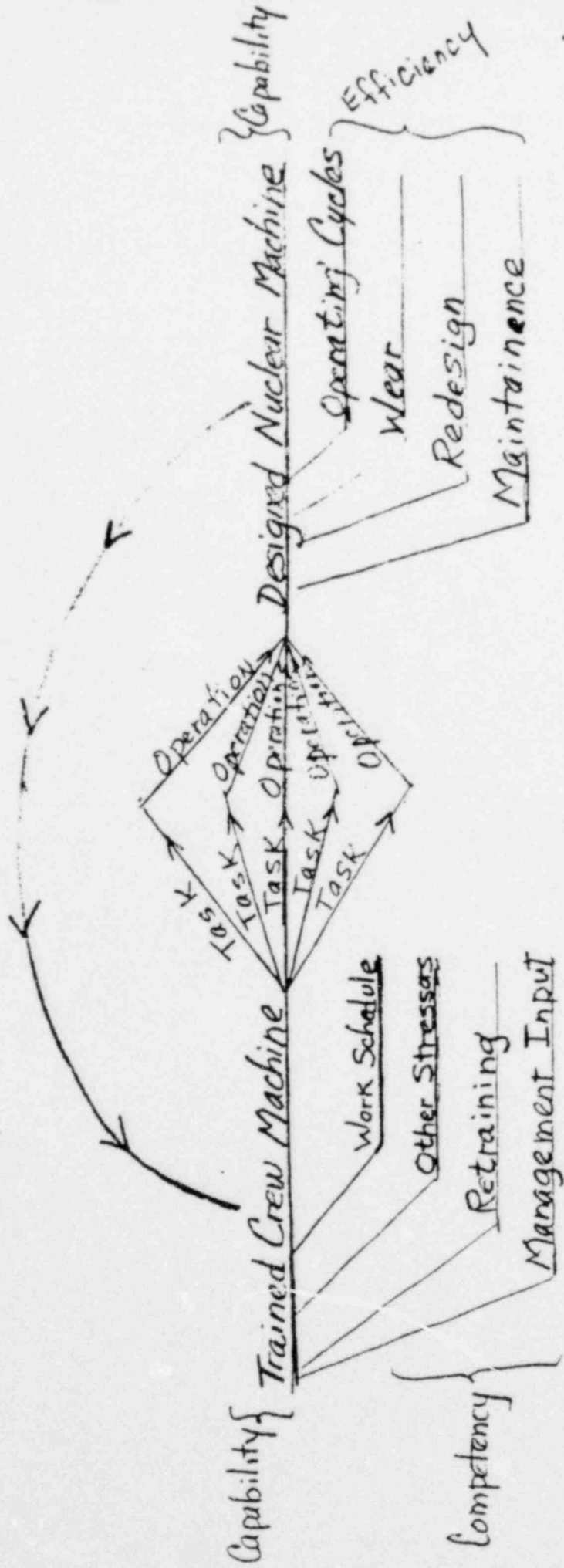
Inspections of personnel performance and training since the accident at Three Mile Island, have shown that in certain situations facility personnel are either required or allowed to remain on duty for extended periods of time. Also, complaints have been received from some licensed nuclear power plant operators concerning the number of continuous hours they have been on duty.

Licensee management is responsible for providing a sufficient number of trained personnel who are in the proper physical condition to operate and maintain the plant. Licensee management should review their administrative procedures covering the working hours of nuclear power plant staff. These procedures should establish a sound policy covering working hours for plant staff who perform safety related functions (e.g., senior reactor operators, reactor operators, health physicists, auxiliary operators, I&C technicians, key maintenance personnel, etc.)

Subcommittee ANS-3 is currently developing criteria to address the subject of operator work hours. These guidelines will become a part of ANSI N18.7. The NRC is also considering issuing requirements for administrative procedures that would control staff overtime. Until either the ANSI Standard is issued and endorsed by NRC (via a Regulatory Guide) or separate requirements are issued by NRC, it is recommended that the following guidance be used. The guidance should be applied to all personnel performing a safety related function:

1. Scheduled work should be limited to the following maximum work hours:
 - a. An individual should not be permitted to work more than 12 hours straight.

Man-Machine Interface Showing Relationship of Work Schedule to Training



at that pitch. Considering Fig. 10.8, it is evident that by definition (p. 172) the loudness of the note corresponding to the intensity I_1' of P is given by $10 \log_{10} \frac{I_1'}{I_1} db$, where I_1 is intensity value of the threshold

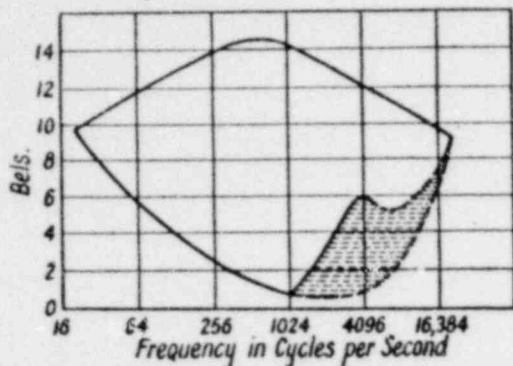


Fig. 10.7. Auditory chart of an individual deaf to high frequencies.

at that pitch. Now in order to make the reference intensity I_1 quite definite it is taken as corresponding to the lower threshold value of audibility (I_0) for a 1000 c.p.s. note. This value, after a large number of experiments here and in America, has been taken as the intensity due to a sound pressure (R.M.S.) of 0.0002 dyne per square centimetre. This new unit of loudness is called the *phon*, and one phon represents

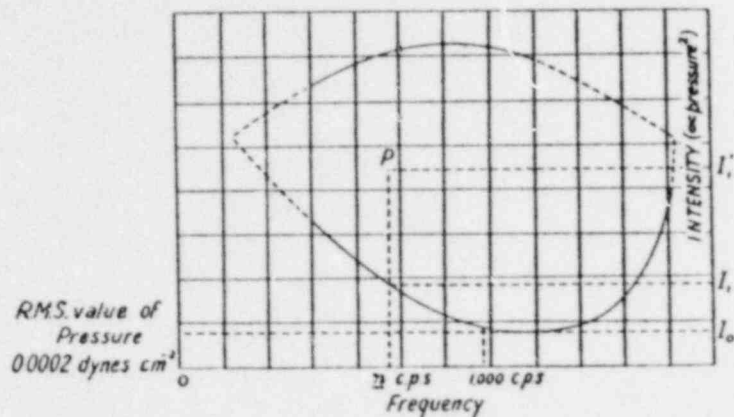


Fig. 10.8. I_1' is given intensity of note corresponding to P of frequency n c.p.s. I_1 is threshold intensity at frequency of n c.p.s. I_0 is standard reference intensity.

about the smallest change of loudness that can be detected by the human ear under average conditions. The loudness of the note P can now be expressed as $10 \log_{10} \frac{I_1'}{I_0}$ phons.

In the perception of frequency a *finite* change of frequency is necessary for the ear to detect a difference, just as in the case of intensity perception a finite change of intensity was required. The ear, however, is more sensitive to changes of pitch than to intensity; for it is able to detect a *percentage* change as small as 0.2 in frequency compared with the most favourable value of 5.0 in intensity. The ratio of the minimum perceptible change δf in frequency to the frequency f is

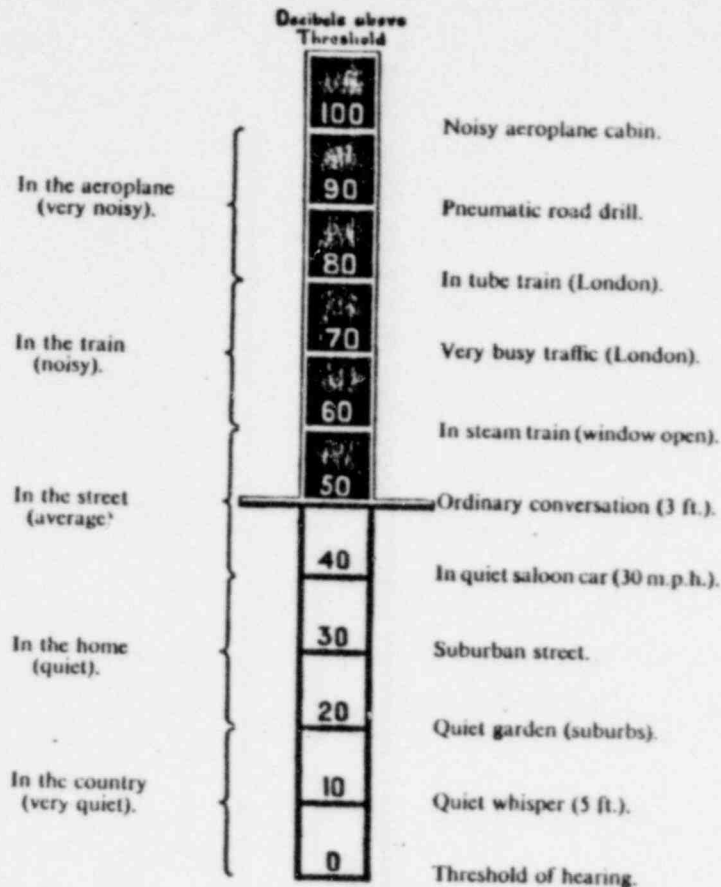


Fig. 10.9. [After Kaye.]

approximately constant over the frequency range, 500 to 4000 c.p.s., which is to be expected if frequency perception like intensity perception is to follow Weber's law of sensation. Fig. 10.9 gives a table of loudness levels of some common noises.

Combination tones

If two simple tones are sounded together, the ear sometimes detects along with them a third tone, often spoken of as a Tartini tone, after

P.H. 24-5.

1 CHAIRMAN SMITH: Is there anything further before
2 we begin with cross examination of Mrs. Aamodt?

3 You had better pull that microphone very close.

4 THE WITNESS: Mr. Smith, does this reasoning hold
5 training has had a nexus to the TMI 2 accident, and thus has
6 been established. Anything that affects training, is that
7 not brought in under the umbrella of training?

8 CHAIRMAN SMITH: No. I can think of many
9 examples. We would not permit training in plant security
10 matters, for example, to be brought. There would have to be
11 some relationship to the circumstances surrounding the
12 accident.

13 THE WITNESS: No, what I meant was training of
14 control room personnel has been perceived as important to
15 the TMI 2 accident, so anything that affects the training of
16 control room personnel --

17 CHAIRMAN SMITH: That would be extending it a step
18 beyond which in our judgment would be related to the scope
19 of this proceeding. We cannot say that all of the training
20 of the control room operators is related to this proceeding.

21 THE WITNESS: Just on the TMI 2 events, is that
22 right?

23 CHAIRMAN SMITH: Yes, or if the Commission
24 specifically -- our rulings have been Contentions and
25 subcontentions must have a demonstrated relationship to the

1 accident. There must be a reasonable analog to the accident
2 or there must be some nexus, arguable nexus, or the
3 Commission itself just says flatly, inquire into it.
4 Sometimes we have not been able to clearly identify the
5 relationship between what the Commission tells us to hear
6 and the accident, but when the Commission tells us to hear
7 something, we hear it. We do not quarrel. Other than that,
8 we have to have a relationship, a nexus to the accident.

9 THE WITNESS: I feel as though it is like turning
10 our back on something, much as we turned our back on the
11 human factors considerations and the machine. And now we
12 are considering -- there was a time when an engineer would
13 say, oh, the light was there, you should have seen it. What
14 is the difference? It is on the back of the panel? Or what
15 did it matter that it was on for such a short time or
16 something like that. The fact that the human engineer, the
17 man relating to the machine had problems using the machine
18 were considered the fault of the man, and now we have this
19 thinking of human engineering. The machine, a lot of
20 attention has been paid to that. But we are taking the same
21 attitude that we took formerly to the machine, to the man.
22 We are saying, oh, we have the training, he has the
23 licensing, so what if he is -- what if he cannot manage
24 after six or seven years, or what if -- if working the
25 backshift or having his shifts revolve does affect his

1 performance and he is even telling us about it in the OARF
2 review, it was mentioned, and we are not considering that
3 this part of the interface has to be engineered, and by
4 turning our back on it, I do not think we are making it go
5 away.

6 CHAIRMAN SMITH: That may -- I could agree -- if I
7 agreed with everything you said, I still have no authority
8 -- I mean, we are employees of the Commission. We only are
9 permitted to do what they tell us to do, nothing else. We
10 have no right to enforce any orders or make any inquiries
11 other than those which are within the scope of the hearing.

12 Your point could be a very good one but we are not
13 allowed to decide that.

14 THE WITNESS: And Mr. Smith, I understand that in
15 0694, that NUREG, and that is about TMI 2 related events,
16 that evidently considers hours on shift, doesn't that --

17 CHAIRMAN SMITH: That very well may be. That may
18 be something for you to argue.

19 THE WITNESS: Would that be evidence, then, that
20 this is related and had to be considered by the Board?

21 CHAIRMAN SMITH: I don't even know what 0694 is.
22 I don't know who wrote it. The person is not here. I think
23 it is a basis upon which you can make an inquiry.

24 THE WITNESS: All right, thank you.

25 CHAIRMAN SMITH: But that particular thing I do

1 not believe could be evidence itself, that fatigue was a
2 contributor to the accident or to the consequences of the
3 accident. I do not know what the record -- it has been a
4 very, very long record, many, many items coming in. I do
5 not know what you might be able to find or what you are
6 aware of.

7 You have, incidentally, prevailed on this issue as
8 far as being allowed to make your argument that pending
9 showing a connection to the accident, that portion of your
10 testimony has been received.

11 THE WITNESS: Thank you.

12 CHAIRMAN SMITH: All right. Anything further
13 before Mrs. Aamodt is cross examined?

14 (No response.)

15 CHAIRMAN SMITH: All right. We will begin with
16 Mr. Blake then.

17 CROSS EXAMINATION

18 BY MR. BLAKE:

19 Q Mrs. Aamodt, my first questions will be directed
20 toward an understanding of your familiarity with the subject
21 matter and with cited references in your testimony.

22 Let me start by referring you to page 1 of your
23 testimony. In the very first paragraph you state, your
24 first sentence of your testimony states that study of a
25 series of documents has not exacerbated the concern

1 expressed in your Contention No. 2.

2 Would you describe for me the nature of --

3 CHAIRMAN SMITH: We have another difference in the
4 testimony as presented.

5 (Board conferring.)

6 CHAIRMAN SMITH: My copy does not have the word
7 "exacerbated."

8 THE WITNESS: I have exerbated. That might not be
9 the right use of the word. I changed it to explicated.
10 What I mean is it has not relieved my concern. Maybe I
11 misused the word.

12 CHAIRMAN SMITH: I don't have any --

13 MR. AAMODT: I have a blank in mine, too.

14 THE WITNESS: Why don't we put "does not relieve
15 the concern expressed." Maybe we can all understand that
16 better.

17 MR. AAMODT: What is the word?

18 BY MR. BLAKE: (Resuming)

19 Q Relieved is your preference?

20 A Yes, I think so for communication's sake. Words
21 mean different things to different people sometimes.

22 Q Mrs. Aamodt, your testimony now is a study of a
23 series of documents which you reference has not relieved a
24 concern which you expressed in Aamodt Contention No. 2.

25 Describe for me the nature of the study of first

1 NUREG-0660, which you went through prior to submitting this
2 testimony.

3 A Reading and underlining and rereading, that type
4 of study.

5 Q Mrs. Aamodt, did you read, underline, reread and
6 study all of NUREG-0660?

7 A I reviewed the entire NUREG to see what areas were
8 pertinent to my Contention and then specifically studied
9 those areas that were pertinent to my Contention.

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1 Q And those areas were?
2 A Mostly areas 1, 2, and 3.
3 Q 1, 2, and 3?
4 A Specific 2 and 3, definite. Let me take a look
5 and see where my underlines go.
6 (Witness reviewing document.)
7 1, 2 --
8 MR. AAMODT: I would like the record to show that
9 there is a lot of underlining.
10 THE WITNESS: And 3 is where I have read and
11 underlined, and I have looked over the rest. I took the
12 rest of it out of my notebook.
13 BY MR. BLAKE: (Resuming)
14 Q Maybe -- what are areas 1, 2, and 3 that you are
15 referring to?
16 A Well, I will have to go back and look specifically
17 what they were. Area 1 was --
18 Q Is this Task Roman numeral I that you are
19 referring to?
20 A I.A -- I can pick it up better here. I read it in
21 the introduction -- I read the introduction, and I looked
22 through Table 1, the priorities, to see, and I crossed out
23 some things in there to see what priority was given to
24 different things. I read the introduction several times. I
25 read some of these things. I read Task I.A. Task I.A.1,

1 that is, I.A.2.

2 I.A.1, you wanted to know what that was about.

3 Let me see. That was about operating personnel. And
4 operating personnel and staffing is the first subtitle under
5 that, and described the various jobs in the control room.

6 The second task, I.A.2, described training and
7 qualifications of operating personnel. And Task I.A -- Task
8 I.A.3 -- Task I.A.3 described licensing and requalification
9 of operating personnel.

10 Q Is that it? Is that what your study of NUREG-0660
11 was --

12 A Those areas I studied because I felt they had the
13 most to do with my Contention, yes.

14 Q Did you look, for example, at Task II.B.4 related
15 to training for mitigating core damage?

16 A I would have to get my copy of that, which is at
17 home, to know whether I specifically read that or not. I do
18 not have it here. See, I --

19 Q Do you recognize that term?

20 A I only got that -- I recognize the term.

21 Q But you do not recall whether or not you read it?

22 A I do not know whether I studied it. I am sure I
23 read it, but I do not know whether I -- I am not sure I even
24 read it. I do not want to tell a lie. I do not know
25 whether I read it or not. But if I did look through the

1 entire NUREG-0660 --

2 Q With regard to NUREG-0680, the next item which you
3 reference, what was the nature of your study of that
4 document?

5 A Well, I have it here. I studied most of these
6 documents as far as they related to my own contention,
7 because, as Mr. Smith has pointed out, there have been so
8 many -- and others have pointed out this has been a very
9 long and complicated hearing, and no one could read
10 everything that was in this hearing.

11 I see I studied here particularly page 39 and 40
12 and 41 and 42 and 43, 45. Then over here, on Appendix A, I
13 note that I have markings on 3, 4, 5. I only marked where I
14 felt something was -- I wanted to put my eye on it again so
15 that I would not, you know, waste a great deal of time
16 rereading everything. I see over here, page 9 in Appendix
17 B, page 6 in Appendix B, page 5. And that seems to be most
18 of my markings in that book.

19 Q And those then were the pages which you studied in
20 NUREG-0680?

21 A The ones that I have found in perusing through
22 this. There may be some others. But they appear to be
23 where my -- most of my study was.

24 Q The next item which you cited was NUREG-0737.
25 Would you go through the same process for 0737, describing

1 your study?

2 A I do not have that here with me.

3 Q Well, would you describe from your recollection
4 what the nature of your study was of 0737?

5 A I honestly have no recollection now of what that
6 was. I really do have to -- give me a copy of it so I can
7 look through it and tell you.

8 Q I will provide you a copy of it.

9 A All right.

10 (Counsel handing document to witness.)

11 (Witness reviewing document.)

12 I would have looked, if I recall, at the areas
13 that were applicable again to the Contention. This is a
14 document that came out recently, November 1980. I cannot
15 really tell you here. Shift manning, I am sure -- I know I
16 looked at that. That I know I specifically looked at. That
17 is on page -- well, it is I.A.1.3. I remember seeing that.
18 And on the shift technical adviser.

19 Q Your testimony is you read the portion on shift
20 manning and the portion on shift technical adviser?

21 MR. AAMODT: Mr. Smith, may I object to this?
22 There is no way on earth Mrs. Aamodt can recall what she
23 read to prepare her testimony.

24 CHAIRMAN SMITH: He has a right to establish
25 that.

1 MR. AAMODT: Any deficiencies that can be implied
2 from what she read can be --

3 CHAIRMAN SMITH: Whatever it is, it is.

4 THE WITNESS: This -- this business here -- this
5 enclosure I.1.A.2.15, that was at the back of the OARP
6 review. And I read it there. Qualifications of reactor
7 operators, from Mr. Denton. I -- I think it was apparent in
8 my cross questioning that I had studied some of these
9 documents.

10 BY MR. BLAKE: (Resuming)

11 Q My question relates now to 0737 and what the
12 nature of your study was that you indicated you did of
13 0737.

14 A I answered that to the best of my ability, Mr.
15 Blake.

16 Q And was it your answer that you read the two
17 sections which you just referred to?

18 A Well, I know I read those. How many others I read
19 I really would not know without going through and rereading
20 it.

21 Q Let me turn for a minute to one of those which you
22 just cited. Let me turn to I.A.1.3 with regard to shift
23 manning. And in particular, on page I.A.1.3-2, which is
24 also expressed in the lower right-hand corner as 3-7.

25 A As what?

1 Q 3-7.

2 (Pause.)

3 CHAIRMAN SMITH: Did you say 3-7 is the page
4 number?

5 MR. BLAKE: Yes. It is indicated that way.

6 THE WITNESS: I have that page, Mr. Blake.

7 BY MR. BLAKE: (Resuming)

8 Q If I could refer you in the middle of that page to
9 the statement which begins, "If a reactor operator is
10 required to work," do you see that?

11 A Yes, I do.

12 Q Would you read that sentence, please?

13 A Surely. "If a reactor operator is required to
14 work in excess of eight continuous hours, he shall be
15 periodically relieved of primary duties at the control board
16 such that periods of duty at the board do not exceed about
17 four hours at a time."

18 Q Mrs. Amodt, were you familiar with that statement
19 in 0737 prior to your providing your prepared testimony?

20 A I do not believe that I examined it. It seems to
21 be very strong -- very strong evidence in support of my
22 concern about fatigue. But I am glad I -- you pointed it
23 out to me, Mr. Blake.

24 Q Was this one of the two which you indicated you
25 had studied?

1 A I have studied this, yes. I did not dwell on
2 every word, Mr. Blake, or I wouldn't be here today. I have
3 no secretary.

4 Q I am sorry?

5 A No research people. This is not my primary job.
6 I --

7 MR. BLAKE: I regard that as irrelevant to my
8 question, Mr. Chairman. I ask that it be stricken, the
9 comment about the secretary and whether or not it is within
10 her job.

11 THE WITNESS: Mr. Blake, how much time --

12 CHAIRMAN SMITH: It would be probably better, Mrs.
13 Aamodt, if you do not make those superfluous remarks.

14 THE WITNESS: All right. I am sorry.

15 CHAIRMAN SMITH: And we will strike it, but it
16 probably would be better if you just ignored those remarks
17 when she does make them. It does not add, it does not hurt,
18 it just prolongs the whole thing, the whole proceeding.

19 But it is better not to make those comments.

20 THE WITNESS: I am sorry. I will not do that. I
21 feel I should object. I feel that Mr. Blake is -- is not
22 simply questioning me but somewhat badgering and abusing me
23 in the questioning.

24 CHAIRMAN SMITH: No, no. You might as well be
25 prepared, Mrs. Aamodt, because when you undertake to testify

1 as a witness, as a professional, then you have to submit
2 yourself to rather thorough inquiry into the basis for your
3 professional qualifications.

4 THE WITNESS: Surely.

5 CHAIRMAN SMITH: So it is well -- it is far from
6 arriving at the point of badgering. Just give your
7 answers.

8 THE WITNESS: All right.

9 BY MR. BLAKE: (Resuming)

10 Q Mrs. Aamodt, do you know the connection between
11 NUREG-0660 and NUREG-0737?

12 A One was a recommendation; I believe the other
13 carries a little more weight. It is the Board -- the one --
14 in 0737 -- has more the adoption -- I believe those are the
15 ones, the suggestions that were adopted by the Commission.
16 0737.

17 Q The suggestions?

18 A What is that?

19 Q The suggestions?

20 A The recommendations of NRC that were adopted by
21 the Commission.

22 Q That have been adopted by the Commission?

23 A Yes.

24 Q And therefore 0737 in your view would be a
25 weightier document than 0660? Or is that not correct?

1 A At this time it has the approval of the
2 Commission. I don't know how weighty it is. I don't think
3 I can decide affairs of NRC and the Commission. That is
4 outside my area of expertise.

5 Q You would regard 0737 as having been approved by
6 the Commission as having the same, in your view, the same
7 weight as 0660, which is recommendations by the NRC staff?
8 Or are you not prepared to --

9 A I do not think I can comment on the internal
10 affairs of the Commission.

11 Q Okay. Referring to page 3 --

12 CHAIRMAN SMITH: Maybe I need some help. I was
13 under the impresssion that the Commission had given some
14 kind of broad approval to 0660. I understand about
15 NUREG-0737. But -- yes, I understand that.

16 (Bound conferring.)

17 CHAIRMAN SMITH: Oh, okay, I think that is made
18 clear in the abstract. I was wrong.

19 BY MR. BLAKE: (Resuming)

20 Q Mrs. Aamodt, referring to -- looking at page 3 of
21 your testimony, in the next-to-the-last paragraph, the last
22 three words are "in many studies." The paragraph begins,
23 "It would seem."

24 A Yes.

25 Q And the last couple of words in it are "in many

1 studies." Do you have the place?

2 A Yes. Yes.

3 Q Would you describe for me those many studies which
4 you are referring to here? Give me first the name and then
5 the author.

6 A That is a question that indicates, Mr. Blake, that
7 you have not had even a beginning psychology course.

8 Q Mrs. Aamodt, would you please provide the answer
9 to my question?

10 A Yes, because -- I am trying to say, beginning in
11 about 1920 Dr. Watson and Dr. Hunter, under whom I studied
12 at Brown University, began the body of information called
13 "experimental psychology." And studies are so numerous that
14 they would be almost as large in number as the documents
15 that I received from NRC. Many, many studies. This has
16 been a tremendous interest to psychologists, the effect of
17 fatigue on behavior. And to -- to give you one or two
18 examples would simply be trying to show off my knowledge.
19 Any other psychologist would simply accept that.

20 Q Mrs. Aamodt --

21 A That is a basic premise.

22 Q Mrs. Aamodt, I still have not heard the name of a
23 single study and its author.

24 A Can you give me back my Sandia report then? I
25 could use some of those studies. Did that come back to me?

1 MR. AAMODT: Yes, we have it here.

2 CHAIRMAN SMITH: Well --

3 MR. BLAKE: I take whatever source. I want to
4 know what studies she is relying on here.

5 THE WITNESS: Within that there are some studies
6 that show the negative effect of fatigue on performance. It
7 depends very, very much what the performance is as to what
8 the -- what the relationship between our hours on job and
9 performance is. And training also is another important
10 variable in what -- in how this function looks.

11 In a very simple -- a very simple study would be
12 to have someone pick the --

13 BY MR. BLAKE: (Resuming)

14 Q Mrs. Aamodt, I asked and I will continue to try
15 to ask precise questions. I would really prefer to have
16 answer which is responsive to my question.

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1 CHAIRMAN SMITH: Remember, Mrs. Aamodt, the
2 difficulty we had.

3 THE WITNESS: Yes.

4 CHAIRMAN SMITH: The other day trying to get the
5 panel to answer your question directly. So you should be
6 sympathetic now to Mr. Blake's problem. He has a plan that
7 he is trying to establish certain points he has a right to
8 establish, and you are required to give him direct answers,
9 not argue with him.

10 THE WITNESS: Yes.

11 Well, if there were a study -- I asked the NRC, is
12 there a study which indicates how the performance, control
13 room performance is affected by fatigue. They said there
14 was no such study.

15 CHAIRMAN SMITH: Just a moment. Isn't the
16 question still trying to identify studies that you relied
17 upon? That is the question.

18 THE WITNESS: The studies that I relied upon are
19 in the body of literature of experimental psychology, and
20 whether any of them specifically relate to the control room
21 performance in particular, they relate in general in that
22 all of the evidence from experimental psychology as well as
23 from our own observations are that performance alters as a
24 function of time on the job.

25 CHAIRMAN SMITH: You are explaining what the

1 studies say. Be sensitive to Mr. Blake's question. All he
2 wants you to do is identify the studies, not explain them,
3 not argue them, not justify your conclusions, but identify
4 the studies.

5 This is a traditional form of cross examination.

6 THE WITNESS: It is a similar question, though, if
7 there should be some fundamental principle of engineering
8 which you would then cite in your testimony, and you would
9 be asked, then, what specific study brought you to know that
10 this specific fundamental in engineering is true. This is
11 just a premise in the field -- this is a theory that has
12 been proved in the field of psychology by numerous studies.

13 CHAIRMAN SMITH: We understand that. You do not
14 have to explain further. The same questions can very well
15 be put to an engineer on the stand and he might give the
16 same answer now which would enable Mr. Blake to ask his next
17 question.

18 MR. AAMODT: Could I talk to Mrs. Aamodt. She is
19 on the witness stand.

20 CHAIRMAN SMITH: If you can help her, I do not
21 think anyone would object.

22 (Mr. and Mrs. Aamodt conferring.)

23 THE WITNESS: Well, I did studies myself on the
24 effect of fatigue on performance. One of them was a dialing
25 study at the Bell Telephone Laboratories in approximately

1 1952 or '53, and this study showed that as a function of
2 hours of dialing, numbers of errors increased. I also did a
3 study with white rats at Brown University in a Skinner box,
4 and this was a study on the extinction of a habit and the
5 relationships of fatigue to that extinction -- to the
6 extinction of a habit. And the results are too complicated
7 to discuss here.

8 CHAIRMAN SMITH: We are not asking the results.

9 THE WITNESS: But those are two studies of fatigue
10 in which I have participated and observed the effects of
11 performance on fatigue.

12 BY MR. BLAKE: (Resuming)

13 Q Mrs. Aamodt, is it your testimony now that the
14 study on the white rats which you did at Brown University or
15 with regard to the dialing which you did while employed by
16 Bell Telephone are the studies which support your statement
17 here with regard to operator performance in nuclear power
18 control room?

19 A No.

20 Q Yes or no, is that your testimony?

21 A No.

22 Q Okay. Then do you have another study which you
23 would cite?

24 A Not specifically.

25 Q Thank you.

1 Mrs. Aamodt --

2 MR. ADLER: Mr. Chairman, Mr. Chairman.

3 CHAIRMAN SMITH: I think one of the problems
4 perhaps --

5 THE WITNESS: I am sorry.

6 MR. ADLER: Mrs. Aamodt does not have at her
7 fingertips the studies which might support this paragraph.
8 I think she should be informed that if she has references at
9 home, that she be able to supplement her testimony with that
10 information as Licensee's witnesses have been given the
11 opportunity to supplement their testimony when they do not
12 have at their fingertips the information requested by the
13 question.

14 THE WITNESS: Might I also say, before that is
15 answered, too, that let me cite some of these studies.
16 There is on page 3 of the Sandia Report, 1963, a German
17 study, Haider, reported by Grandgeane, 1968, demonstrated
18 almost a linear decrement and a measure of attention over
19 five hours of a continuous, monotonous work. Here is
20 another one, a study which is a Swedish study reported in
21 Murice, 1975, page 39, and in Morrell, 1969, pages 432 to
22 434, where the shape of the curve of performance over hours
23 in the evening or swing and night or graveyard shifts
24 differs considerably from that of the day shift. This is
25 especially true according to Murice and other writers on

1 shift work, when personnel operate on a changing shift
2 status.

3 Most authorities ascribe this fact to interruption
4 of strong sleep habits.

5 The Turnbull review also mentions the effects of
6 losing even one night's sleep, a possible occurrence in
7 nuclear power plants during shutdown and startup operations
8 for critical personnel. Experiments indicate that detection
9 of visual targets deteriorates markedly, choice behavior
10 demands more time and exhibits more error, reading rate
11 decreases, though comprehension does not, visual blurring
12 and diopia are accompanied with the beginning of
13 misperception, and where learning of a complex mental task
14 is still taking place, the increment is reduced. Longer
15 periods --

16 BY MR. BLAKE: (Resuming)

17 Q Are you reading from the Sandia Report?

18 A Yes, I am.

19 Q Reading from page 5?

20 A Page 5.

21 Q Could I ask you to take a look at the last
22 sentence in the top paragraph on that page and read that,
23 please, the sentence that begins "None."

24 A "None of the laboratory studies are purely
25 relevant to the situation."

1 Which situation? What are we talking about?

2 Q I think if you will read up a little higher --

3 A The problems in estimating the effects of hours of
4 work on the kinds of tasks found in nuclear power plants is
5 that the task is not a monolithic one such as a production
6 task. The plant operator ordinarily has a relatively light
7 task but occasionally has to rise to full participation in
8 plant operations, reading displays, interpreting their
9 significance, making decisions, and taking appropriate
10 action. None of the laboratory type studies are truly
11 relevant to this situation. That is just what I have been
12 saying.

13 Q Mrs. Aamodt, maybe we can cut this short.

14 Are you aware of any study which would support,
15 directly support your statement with regard to operator
16 performance and the negative effect of fatigue in the
17 control room?

18 A All of these studies are suggestive that there is
19 an effect of fatigue. Effects of fatigue are very well
20 established. They obviously are not -- nuclear plant
21 operators are not exempt from fatigue. The effects of
22 fatigue are very well established. Exactly what that
23 function is for nuclear power plant operators has not been
24 determined, and that is what I have been saying, and you
25 have proved it, Mr. Blake.

1 Q That is that there has not been a negative effect
2 of nuclear power plant operators established?

3 A What is that?

4 Q I said --

5 A Just because it has not been established does not
6 mean it is not there. The effects of fatigue -- nuclear
7 power plant operators are not exempt from the effects of
8 fatigue.

9 Q And what is the nature of the fatigue you are
10 talking about for the nuclear power plant operator?

11 A The nature of fatigue is complex, as has been
12 stated.

13 Q Have you ever been in a nuclear power plant, Mrs.
14 Aamodt?

15 A I have not. I have simply read about it.

16 Q Have you ever been in a control room?

17 A No, I have not.

18 Q Have you ever been in a simulator?

19 A Yes, I have.

20 Q In a simulator for a nuclear power plant?

21 A Yes, I have.

22 Q Would you describe that simulator, when you were
23 there?

24 A Limerick, and I was there in October of this year.

25 Q When did the Limerick simulator begin its

1 operations?

2 A I do not now.

3 Q Was it operating the day you were there?

4 A Oh, yes.

5 Q Did you see operators working in there?

6 A I saw instructors working in the simulator.

7 Q Instructors working in it?

8 A The instructors demonstrated a number of scenarios
9 to us and we spent about an hour in the simulator.

10 Q And is it this experience which leads you now to
11 extend to nuclear power plant operators your opinion with
12 regard to fatigue?

13 A No. My opinion is not based on my knowledge of
14 nuclear power plants. It is based on my knowledge of human
15 behavior.

16 Q Your knowledge of human behavior did you say?

17 A Yes. My studies -- my studies and work in human
18 behavior, and as I said, these are still human beings who
19 are working in nuclear power plants, and the same
20 principles, the principles of learning, retention, etc., in
21 experimental psychology have not been refuted in nuclear
22 power plants. These general principles hold there as well
23 as anyplace else, just as engineering principles do hold for
24 any mechanical piece of apparatus.

25 Q So you have never been in a nuclear power plant.

1 You are unaware of a study of nuclear power plant
2 operators. Is that correct?

3 A You asked me two questions. Which one?

4 Q Let's take them one at a time. That is a fair
5 observation.

6 I am sorry. What was the note that was passed?

7 MR. AAMODT: Maybe that is not proper. I
8 interjected. I am sorry. We have done this very much
9 together. We have read about the accident so many times
10 from so many studies that that seems to me considerably more
11 valuable than to have been three or four days, for example,
12 in a nuclear power plant. It is an inappropriate line of
13 questions.

14 CHAIRMAN SMITH: No, the questions are appropriate.

15 MR. AAMODT: All right.

16 THE WITNESS: But Mr. Blake, I would not, if I
17 spent five days in a nuclear power plant, I would prefer to,
18 as Mr. Aamodt said, rely on the expertise of others. Any
19 person in a field that is not directly related to his field
20 but who is trying to offer expert opinion in this other
21 field relies on experts in that other field, and that is
22 what I have done. I have relied on the experts from NRC and
23 from your company, and the consultants that you have hired.
24 I have relied on their opinions in bringing my -- in making
25 my studies and conclusions.

1 CHAIRMAN SMITH: Excuse me. We need a break here.

2 (Board conferring.)

3 CHAIRMAN SMITH: Dr. Little is pointing out that
4 Mrs. Aamodt has not claimed in the paragraph that you are
5 pointing to that she has studies that she refers to relate
6 to the negative effect of fatigue on the performance of
7 nuclear power plant operators, and she is pointing out in
8 her narrative testimony also that she is extending that
9 principle from what she knows. So I think you can probably
10 quickly establish to what extent she purports to know and
11 does know anything about performance of nuclear power plant
12 operators. It can quickly be done. Just get to it.

13 But Dr. Little felt that you were -- there was a
14 straw man here. You were imputing to her something she
15 really is not saying.

16 MR. BLAKE: Dr. Little's observation is absolutely
17 correct. I understand the two clause difference in that one
18 paragraph you are referring to. If it came across some
19 other way, then I would have misspoken.

20 I understand that there is a distinction there,
21 and I understand Mrs. Aamodt's testimony to have been that
22 she relies on other studies, laboratory studies of one sort
23 or another, plus an hour in the Limerick simulator.

24 THE WITNESS: I cannot hear you again, Mr. Blake.

25 BY MR. BLAKE: (Resuming)

1 Q I understand your testimony to be that you are
2 unaware of any studies regarding nuclear power plant
3 operators, but you rely on laboratory studies and one hour
4 in the simulator.

5 A The Sandia Report --

6 Q Is that correct.

7 A -- had some things to say about nuclear power
8 plants, both what you picked up, which had one point of
9 view, and others.

10 Now, I would have to really read through it
11 again. There was nothing that was so strong that I would
12 have used it, even though it would have helped my case,
13 because I did not feel that -- I don't feel -- I thought
14 that the question should be left open in fairness to the
15 safety of your plant and our lives, that the question should
16 be left open to be resolved, that there was no resolve that
17 would satisfy me as a scientist.

18 There are studies, but that does not mean that we
19 have the answer, and there are more than that in here, but
20 to me, that would discredit me as an expert witness, to draw
21 on studies that had -- that had drawn conclusions on a
22 restricted group of -- restricted amount of evidence, and I
23 am sure I could have found you many studies to prove that
24 all of the functions in the control room, taking them one by
25 one, were subject to fatigue, but whether that would say

1 anything more than is said by just referring generally to
2 the known fact that fatigue does affect behavior and
3 therefore control room behavior, and that we do not have all
4 the answers, that is what I am pointing to.

5 Q Mrs. Aamodt, let me see if we can get to the
6 application. Is it now -- correct me if I am wrong -- is it
7 now your testimony that these studies may or may not apply
8 to nuclear power plant operators but that you have not as a
9 scientist satisfied yourself.

10 (Pause)

11 A That the studies may or may not apply. All
12 studies apply in that they are all about people, and people
13 are involved, but how to interpret them in relationship to
14 nuclear power plant, the control room operator would be
15 difficult to do, and so I did not try.

16 You can prove your case with anything if you do
17 not have efficacy. If you are trying to -- it is easy for a
18 scientist to bring forth that which proves his case and
19 withhold that which does not. I simply am posing the
20 problem which is indicated by the body of knowledge of
21 psychology and saying don't we need to know the answers to
22 these questions.

23

24

25

1 Q Mrs. Aamodt, if I could refer you to page four of
2 your testimony, where you refer in the first paragraph under
3 "Training on Simulator," that is not an exact replica in the
4 last line in the paragraph, to Oak Ridge Laboratories first,
5 and then second, to the review committee.

6 A Yes, I see that.

7 Q The entire sentence suggests that -- that a number
8 of hours of recommended simulator time or a number of hours
9 of recommended simulator time or a number of hours of
10 simulator time have been recommended by Oak Ridge
11 Laboratories.

12 Can you give me a citation for that?

13 A From what I understood in cross questioning the
14 other day --

15 Q Or a reference.

16 A That 1000 hours per six units was equal to 26
17 hours per crew. Now, I am accepting that.

18 DR. JORDAN: It seems, if I remember right, we
19 decided that that was TVA recommendation rather than Oak
20 Ridge.

21 WITNESS AAMODT: Oh, I am sorry. Is that the
22 problem? Yes. It is TVA.

23 BY MR. BLAKE: (Resuming)

24 Q This is the Dr. Johnson recommendation from TVA?

25 A Yes.

1 CHAIRMAN SMITH: Is that a correction in your
2 testimony?

3 WITNESS AAMODT: Yes, TVA in two places.

4 CHAIRMAN SMITH: I see one place in the last
5 line. Where is the other place?

6 WITNESS AAMODT: The other one is in the first
7 paragraph under -- the last line, first paragraph, last line
8 of the page.

9 CHAIRMAN SMITH: Simply substitute TVA?

10 WITNESS AAMODT: TVA Laboratories.

11 BY MR. BLAKE: (Resuming)

12 Q Is the basis for that statement or reference to
13 what is now TVA, the statement in the GARP report?

14 A In the Review Committee's report, yes.

15 Q And it is your testimony that we fall far short of
16 Dr. Johnson's recommended hours on the simulator?

17 A And others, yes.

18 Q Let me stick just with Dr. Johnson or with the TVA
19 recommendation at the moment. Is it your testimony now that
20 we fall far short in use of the simulator from the
21 recommended number of hours?

22 A As I understand the hours they recommend and the
23 hours that the operators had directly in use of the
24 simulator, yes.

25 Q Do you recall asking these questions of Dr.

1 Christensen on several occasions going through the hours?

2 A I remember the amount of confusion we had on the
3 subject, and I worked it out several times myself.

4 Q It was -- it is my recollection, and I would ask
5 whether or not you recall this as well, that Dr. Christensen
6 testified first with regard to the first -- well, he
7 testified that TVA was involved in two respects; first, with
8 their use of their simulator and how long they use it, and
9 that with a minimum in my recollection of two weeks, and
10 there was a recommendation by Dr. Johnson of TVA, and that
11 was where we got into the \$1,000 to \$1,500 business.

12 We went through the arithmetic.

13 A Dr. Johnson evidently recommended two weeks, which
14 would be --

15 Q Okay.

16 A I would assume eighty hours, forty hour weeks. I
17 understood that the Met Ed personnel had 16 hours of
18 actually on the simulator, and four hours in TMI-2 events,
19 which would be 20 hours.

20 Q I --well, it is your testimony now that Dr.
21 Johnson was recommending a minimum of more hours on the
22 simulator than what we now use. Is that correct?

23 A Yes.

24 Q Okay. What was your understanding of what we now
25 do?

1 A I understand that there are four and a half days
2 spent in Lynchburg, Virginia, and that four hour periods are
3 spent on the simulator, and that in addition to that, the
4 personnel had four hours specifically on TMI-2 events.

5 Q Now, is that the nature of the simulator training
6 in the OARP program that you are referring to?

7 A That is what I understood.

8 Q Are you also familiar with the requalification
9 training program?

10 A I have looked at that. I believe that there is
11 again the same one-week or 16 hours on the simulator.

12 Q Yes. Now, are you familiar as well with initial
13 operator training and the requirements for training on the
14 simulator that initial candidates for licensing go through?

15 A I understand that is one week again on the
16 simulator.

17 Q Now, as to the second portion, the Review
18 Committee -- the number of hours recommended by the Review
19 Committee --

20 A The Review Committee --

21 Q Where did those hours come from?

22 A Seemed to be pointing to the disparity between TVA
23 recommendations and others' recommendations, and in pointing
24 to that disparity, seemed to be recommending that more use
25 be given on the simulator.

1 They also had a whole section on the simulator,
2 and using -- having a full pack at the simulator, and it
3 seemed that -- that there was a great deal of emphasis on
4 simulator -- what simulator training could do.

5 Q Where in the OARP report are the number of hours
6 of simulator training that is recommended by the Review
7 Committee -- where is that set out?

8 A How many hours they recommended?

9 Q Right.

10 A Not specifically. There is an imprecision in my
11 testimony there, if that is what you were pointing out.

12 Q And the number of hours for Oak Ridge Laboratories
13 that you were referring to in your testimony is the 1,000 to
14 1,500 figure?

15 A The 1,000 to 1,500 was TVA's as well as the two
16 weeks. Those were all recommendations that emanated from
17 TVA, both two weeks and 1,000 to 1,500 hours. Those were
18 considered minimums, the 1,000 to 1,500. The two weeks was
19 considered evidently more appropriate and then others
20 recommended as much as six or seven weeks.

21 Q Mrs. Aamodt, let me refer you to the OARP Review
22 Committee Report. Do you have a copy?

23 A Yes, I do.

24 Q It is on page 99, the language about the simulator
25 hours.

1 A Page 29?

2 Q No, 99.

3 A Ninety-nine. Yes, yes.

4 Q It is the second paragraph from the top.

5 A Yes.

6 Q The first sentence is the one that refers to the
7 two weeks.

8 A That is right.

9 Q Do you recall what Dr. Christensen's testimony
10 with regard to that two weeks, that that was a factual
11 statement by Dr. Johnson of what TVA does, or is it your
12 recollection the way he testified was that that was a
13 recommendation?

14 A I would prefer to answer on the basis of what is
15 said here, rather than what Dr. Christensen said, because
16 there were so many things said. I really do not remember
17 exactly what Dr. Christensen said.

18 Q Do you recall that Dr. Christensen was an author
19 of this report and in fact, authored this very section?

20 A Yes, and --

21 Q Okay. Why don't you give me your --

22 A Dr. Christensen had a great deal of trouble just
23 figuring out what this meant.

24 Q If you would give me your interpretation then of
25 those two sentences, the first one then with the two weeks,

1 the next one with --

2 A Well, what I understood was that the 1,000 units
3 would mean that if you had 1,000 hours, would mean with six
4 nuclear units that you would have six divided into that -- I
5 think that comes out to something like 166, and that would
6 be 1,166.

7 Then the next step -- I am not -- I have to take
8 on faith, which is that when you divide that by the number
9 of crews, and that I have -- was planning to try to find out
10 a little bit more about before putting in my firings of
11 fact, but if it is true that you divide among the number of
12 crews, that would not seem to me like a legitimate way to do
13 it because some plants run on five crews and some run on six
14 crews.

15 So does it mean that if you have five crews, they
16 need less simulator training? I mean, more simulator
17 training than if you have six crews? So this is certainly
18 imprecise, whether it means that there should be 166 hours
19 for all of the operators in that unit, or whether it means
20 that you can divide that by the number of crews and then you
21 are down to 26 crews -- 26 hours.

22 That is 16 and 4 are 20. Now, 26 hours was the
23 minimum, and if you take the other end of that, 1,500, that
24 is half again as much, and that brings you up to 38 hours,
25 and they received 20, which is half that amount.

1 The Met Ed people received half that number on the
2 simulator since the TMI-2 accident.

3 Q That is what your understanding of that statement
4 is, or you still need to check further?

5 A Well, remember, I am taking that on the basis that
6 it is correct to divide the 166 hours by the number of
7 shifts. There seemed to be some cloudiness and perhaps you
8 would explain to me, Mr. Blake, how that is reasonable that
9 if you have five shifts, they have more training on the
10 simulator, and if you have six shifts, they have less, and
11 if you have four shifts, they would have even more.

12 We could -- I do not know. Maybe you could
13 explain that to me. I do not understand that, but even
14 dividing it again by the number of shifts, we still have 26
15 hours on the low side and 38 on the high side, and MI -- is
16 that what you wanted to know?

17 Q What I was trying to get was your interpretation
18 of that language.

19 A My interpretation is based on Dr. Christensen's
20 instructions of how to figure that out.

21 Q Okay.

22 A My interpretation of Dr. Christensen's
23 instructions.

24 Q Okay. On page four of your testimony, you also
25 refer to the Limerick -- I guess you do not actually refer

1 to it. You refer to Philadelphia Electric's replica and
2 Pennsylvania Power and Light's replica.

3 A Yes.

4 Q Tell me about how you -- how you became familiar
5 with those two simulators.

6 A This one I just read about in the newspaper. I
7 was particularly interested because I had the contention in
8 on training and testing.

9 Q You also indicated before that you also spent some
10 time at one of these two simulators.

11 A At the Limerick simulator. I spent all day at the
12 plant and about an hour at the simulator.

13 Q And during the time you were there at the Limerick
14 simulator, instructors went through and showed you how they
15 worked?

16 A Yes, they did.

17 Q And with respect to the other simulator, your
18 knowledge comes from this press clipping, which is
19 Attachment 1 to your testimony.

20 A It was no knowledge of the simulator I was after;
21 it was knowledge of an analysis of the simulator made by the
22 people who used the simulator. I was not attempting to
23 acquaint myself with the simulator, but attempting to
24 acquaint myself with analysis that the people who worked
25 with the simulator made of it, the instructor, Gary

1 Merrill, who is mentioned there and Paulsen, what they said
2 about it. Since they were working with it, their
3 impressions were important to me.

4 (Pause.)

5 Q On page seven of your testimony, you refer to just
6 above where the quote appears, you refer to IE circular
7 80-02, and you have now made that an attachment to your
8 testimony, page one of 80-02. Have you read the entire
9 circular, including page two?

10 A Yes.

11 Q Do you have a copy there of page two?

12 A Yes, I do.

13 Q Looking for the moment at your testimony on page
14 seven, on the bottom paragraph on that page, is that a
15 quote? Does that purport to be a quote from IE circular
16 80-02, or is that your testimony?

17 A You mean the one that begins, "The proper length
18 of shift"?

19 Q Yes.

20 A That is my own.

21 Q That is not a quote?

22 A No.

23 (Pause.)

24 Q Turning for a minute to 80-02, do you have that
25 there, the paragraph which you cited from it, quoted from

1 it? Where does that appear in IE circular 80-02, at the
2 end, the beginning, the middle?

3 A It is their opening paragraph.

4 CHAIRMAN SMITH: What was the answer?

5 WITNESS AAMODT: The opening paragraph, the first
6 paragraph.

7 BY MR. BLAKE: (Resuming)

8 Q And based on what that paragraph says, did NRC do
9 anything about the problem associated with fatigue or the
10 subject of fatigue or the subject of length of shifts?

11 A From the recommendations and my experience as a
12 psychologist, I would say that the recommendations did not
13 follow from the first paragraph.

14 Q That is what NRC in that circular determined to do
15 with regard to limitations on hours to be worked -- did not
16 follow from the paragraph which you have quoted?

17 A That is right.

18 CHAIRMAN SMITH: As I read this testimony, I
19 thought that there were two quoted paragraphs because there
20 are two paragraph that were single-spaced. Did you just --

21 WITNESS AAMODT: That was a mistake in typing. I
22 am sorry. I just did not change the typewriter there. That
23 should have been double-spaced. I am sorry. I see that.

24 (Board conferring.)

25 CHAIRMAN SMITH: Well, so I think that I will

1 emphasize that -- the quotes on the copy?

2 WITNESS AAMODT: Yes, that is all right.

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1 BY MR. BLAKE: (Resuming)

2 Q Focusing on the last page there, Mrs. Aamodt, the
3 last paragraph on that same page, the proper length of shift
4 with regard to the Navy's standards for shifts and lengths
5 of shifts, what is your -- what is the basis for your
6 knowledge of Navy shift lengths?

7 A Simply -- and I may be incorrect on that. It
8 appears to me that I have a bias as to six hours, and that
9 perhaps an interrogatory -- answer to interrogatory came
10 that they were four hours. I do not recall that completely.

11 I know that in relation to the recommendations of
12 NRC that they were much shorter, and that was the point that
13 was attempting to be made here.

14 Are they -- am I correct, Mr. Blake, that they are
15 four -- six hours or are they four hours?

16 Q I am asking for the basis for your testimony here.

17 A Oh, I -- that may be an error that I have made.
18 It seems that I have -- that may that -- have that mind set
19 that the Navy shift was six hours.

20 Now, it seemed as though some information came
21 later from the NRC indicating that it was four hours, but I
22 am not -- my recall on that is not clear.

23 The point -- the difference is what I am clinging
24 to, that they are much shorter.

25 Q That is, they have to work less hours a day than

1 the eight-hour shift would imply in a commercial plant.

2 A They worked less hours, yes.

3 Q Do you know what they do on a Navy shift after the
4 six-hour watch?

5 A I understand from NRC that they have other duties.

6 Q Do you know whether or not those would entail more
7 than two hours or less than two hours, or would that be
8 important to you?

9 A This is -- it would if I were making the study,
10 but not -- not being in a position to make that kind of
11 study, I simply am taking as all scientists do -- going for
12 the hunch that this -- that this is an area where there has
13 been a good safety record.

14 The committees have called Admiral Rickover in to
15 get his opinions, his hunches as to why the Navy program was
16 a safe program -- was a safe program. He said -- I remember
17 some of his testimony, that it is not one thing. It is many
18 things.

19 I was looking at one of these many things. That
20 was differnt than the things that were happening in the
21 commercial nuclear power plants, and this thing being in my
22 area of expertise, fatigue.

23 I entered it here as a -- the principle that they
24 worked fewer hours. Now, whether they worked four hours or
25 six hours or what they were followed with, I am not totally

1 certain of.

2 They were fewer hours than was worked -- than is
3 the standard shift in a nuclear power plant.

4 Q That is they were on shift for fewer hours?

5 A That is right.

6 Q Is your understanding. Mrs. Aamodt, have you been
7 to the B&W simulator?

8 A No.

9 Q Have you been to the training facilities at Three
10 Mile Island?

11 A No.

12 Q Are you familiar with -- have you met, talked
13 with, interviewed or otherwise familiarized yourself with
14 the instructors involved in the training programs for Three
15 Mile Island operators?

16 A I attempted to do some interviewing, but my
17 request was not stated in terms that were within -- within
18 the rules of the proceeding, and I --

19 Q You asked to interview the instructors?

20 A I asked to interview personnel, and I planned to
21 interview them about instructors.

22 Q Have you ever met, interviewed or otherwise
23 familiarized yourself with any of the instructors at Three
24 Mile Island?

25 A No.

1 Q Have you reviewed any of the course curricula?

2 A No.

3 Q Have you -- did you say you have not been to any
4 of the facilities?

5 A What facilities?

6 Q The training facilities at Three Mile Island?

7 A No. When you say, did you familiarize yourself
8 with any of the instructors or their abilities, I
9 familiarized myself with the report of the instructors, the
10 facilities, that those who have the time and the work --
11 were hired to do that job made.

12 These people were in a position to write about the
13 facilities and the instructors in -- from their areas of
14 expertise, and I accepted that and read their review and
15 drew my conclusions from their review.

16 Q That is the OARP review committee?

17 A Yes, and I found some of their conclusions to be
18 in error.

19 Q Well, let's turn to that. On pages -- on page one
20 of your testimony, you referred in the next to the last
21 paragraph to the conclusions of the committee. Is your
22 reference there actually to the abstract, which appears at
23 the beginning of the Committee's document?

24 A The abstract I believe said that, yes.

25 Q Would you refer to page 141 of the Committee's

1 report?

2 A Where do I refer to page 141?

3 Q In the OARP Review Committee report. I say, would
4 you now turn to page 141?

5 A Oh, would I turn to 141?

6 Q Were you aware of this page in the Committee's
7 report?

8 A Yes.

9 Q And were you aware that this page included the
10 conclusions of the Committee?

11 A You made changes and gave us this page after my
12 testimony was prepared.

13 Q I see. I think the record will speak for itself
14 with respect to the change, but there was a typographical
15 change made by inserting one line, the next to the bottom.

16 A I have both pages here.

17 Q Yes. You might take a moment and read through
18 those and see if I have described accurately the nature of
19 the change.

20 (Counsel handing document to witness.)

21 (Witness reviewing document.)

22 A I am ready, Mr. Blake, if you are.

23 Q The question was, were you aware of that
24 conclusion -- those conclusions? Are you familiar with that
25 section of the conclusions? Are you familiar with that

1 section in the GARP Review Committee --

2 A Yes, I am aware of those conclusions.

3 Q Are you aware that those are the conclusions of
4 the Committee?

5 A I am aware that Dr. Gardner indicated that -- that
6 he both agreed with some and not with all.

7 Q I think the record will show that your
8 recollection is incorrect in that he did not disagree with
9 any. There were some that he did not feel in view of his
10 expertise, that he would be able to independently support.
11 Is that your recollection, or is it the recollection that
12 Dr. Gardner said he disagreed with some?

13 A He could not support all of those conclusions?

14 Q Could not?

15 A Could not support all of them.

16 Q Okay. And is it your recollection that the -- is
17 it your understanding that these are the conclusions of the
18 collective committee?

19 A They are, but perhaps your interpretation is
20 different of them than mine is.

21 (Pause.)

22 Q Let me refer you to page two.

23 MR. AAMODT: Mr. Chairman, before we leave that, I
24 think Mr. Blake asked a question about the abstract before
25 that was never answered.

1 Mr. Blake asked my wife that related to the
2 abstract of the report. I wondered if it did. We did not
3 hear an answer.

4 MR. BLAKE: I think the record will show an
5 answer. She said yes, it was from the abstract.

6 MR. AAMODT: I recall she said she did not
7 remember.

8 WITNESS AAMODT: The abstract and the conclusions
9 do not agree.

10 CHAIRMAN SMITH: I do not know what the issue is.
11 I remembered her saying that that was from the abstract. In
12 any event, they can be -- it can be determined without
13 confusion.

14 It does seem to be language taken from the
15 abstract. We are referring now to page one of the testimony.

16 WITNESS AAMODT: Yes. The abstract talks about
17 the -- that the program preparing the NRC reactor operators
18 for taking the examination -- the conclusions indicate that
19 the program has provided them with training and education
20 for safe and reliable operation of TMI-1, and those are two
21 different things.

22 CHAIRMAN SMITH: I do not understand what the
23 issue is between the parties.

24 MR. BLAKE: I have no issue. Mr. Aamodt raised
25 the question, whether or not she has given an answer.

1 MR. AAMODT: The reason I raised that is that this
2 is a statement from the abstract and not the conclusions.
3 The abstract addresses actually a different step than do the
4 conclusions, and my wife drew from that.

5 CHAIRMAN SMITH: I think that that was well
6 established.

7 BY MR. BLAKE: (Resuming)

8 Q Mrs. Aamodt, referring to page two of your
9 testimony, just prior to the listing at the bottom of the
10 page of A, B and C, the statement appears -- your statement
11 is that the Committee considers some of these changes as
12 needed prior to restart. Do you see that?

13 A Yes.

14 Q It is the sentence right above.

15 A I see it.

16 Q What is your reference for that?

17 A Page 24. I believe that is of the human factors.
18 It is Section C, as I remember.

19 (Pause.)

20 Maybe it isn't. Page 27.

21 Q You say in the human factors report, C-24?

22 A Perhaps it is 27, page 27.

23 (Pause.)

24 Are you aware of those changes, Mr. Blake, or
25 where they appear?

1 Q I am asking for the basis of your statement that
2 the Committee considered some of these --

3 A I have obviously made a typing error because those
4 -- I took those directly. They are directly out of the --
5 one of the documents of this hearing, and --

6 Q I can help you in that regard. The specific
7 listing I can find and have seen. My question goes to the
8 Committee considering some of these changes needed prior to
9 restart.

10 A Here they are. It is on page 24 in the first
11 section.

12 Q Yes.

13 CHAIRMAN SMITH: As I understand the question, is
14 it you find the listing in the human factors document and
15 you do not know whether the OARP Review Committee makes
16 those -- is that the point?

17 MR. BLAKE: I do not know whether it is the OARP
18 or what the basis is.

19 WITNESS AAMODT: This is the review of the Three
20 Mile Island Unit 1 control room from a human factors
21 viewpoint committee. This was, I believe, Dr. Sheridan and
22 Dr. Christensen and others.

23 DR. LITTLE: I think that list is on page 24 of
24 Section 3, the list of the carpeting and lighting and so on.

25 MR. BLAKE: Right.

1 WITNESS AAMODT: This is on page 24 of the first
2 Section 3. That is right, Dr. Little, yes, 24 of Section 3,
3 and it was the review committee of that particular body of
4 information.

5 MR. BLAKE: I have a listing. I have no problem
6 with the listing and finding it.

7 BY MR. BLAKE: (Resuming)

8 Q My question goes, the Committee considered some of
9 these changes as needed prior to restart. Your testimony --

10 A Not considered prior to restart -- is not
11 considered crucial to plant safety and reliability.

12 Q Wait. I may have missed -- I'm looking at your
13 testimony on page two, the bottom paragraph.

14 A Yes.

15 Q The second sentence, which on my copy reads, "The
16 Committee considers some of these changes as needed prior to
17 restart."

18 A However, others are not considered crucial to
19 plant safety or reliability, and they are -- I am
20 considering the ones that are not considered crucial.

21 Q And my question goes to your statement, the
22 Committee considers some of these changes as needed prior to
23 restart. I am asking for the basis for that statement of
24 your testimony.

25 A This entire book outlines the changes they

1 considered needed prior to restart. These particular five
2 changes were considered not needed prior to restart, not
3 crucial. It says right underneath them that none of the
4 above is considered crucial.

5 All the others -- there are many others. I did
6 not list all the ones that were considered. They were not
7 in my area of interest. They had been recommended by people
8 who knew that they felt that they were needed and presumably
9 would be adopted.

10 These were considered not crucial to restart, and
11 in examining them I felt that again, the element of fatigue
12 was being overlooked as a critical element in the control
13 room because all of those factors affect the fatigue of the
14 operator.

15 CHAIRMAN SMITH: Mr. Blake, I do not think I
16 understand your question either. Could you rephrase it or
17 readdress it? First there was confusion as to the
18 antecedent, who they are. Now, we understand what "they
19 are" it refers to, those which are not considered crucial.

20 Now, what survives of your question?
21
22
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1 MR. BLAKE: My question has been: Which are the
2 changes which Mrs. Ramodt believes the committee considered
3 to be needed prior to restart, and the basis for that
4 statement.

5 THE WITNESS: You mean you want me to begin at the
6 beginning of this book and read through all the changes they
7 say are needed for restart?

8 BY MR. BLAKE: (Resuming)

9 Q I would like to have you point to one which they
10 say they recommend should be done prior to restart.

11 A Just one?

12 Q Just one.

13 A The way the tags were put on the control panels,
14 the lights.

15 Q Where?

16 A The color of a light, the blue lights were
17 difficult to see. There are many, many changes.

18 Q Which the committee -- did the committee indicate
19 that those were needed prior to restart?

20 A Did they indicate that they were needed?

21 Q Yes. Prior to restart.

22 A Somewhere. Somewhere, yes. And Met Ed had
23 indicated in a bulletin that was just sent out which ones
24 that they would consider needed prior to restart, 0752. You
25 want me to have analyzed all the changes that were

1 considered or to have decided which changes. I feel as
2 though that is requiring a great deal.

3 But you think because I said that the committee
4 considers some of these changes as needed prior to restart
5 -- well, I am sure that there is at least one change that
6 was needed prior to restart. So that -- is that not true?
7 Do you want me to give you specifically which ones that I
8 have knowledge of?

9 CHAIRMAN SMITH: Mr. Blake, can't you be more
10 helpful? Apparently, you are not talking about specific
11 changes; you are probably going to point someplace in this
12 report where the committee says that none of these are
13 required for restart or you are going to challenge her to
14 point out in the report where they say that they are
15 necessary or crucial for restart. That is where you are
16 going. But it seems to me this is taking an awfully long
17 time to get there.

18 MR. BLAKE: Well, I --

19 CHAIRMAN SMITH: You allow her to go on and on and
20 on about maybe this, maybe that. What are we getting to?

21 MR. BLAKE: Mr. Smith, I thought my question was
22 pretty straightforward: What is the basis for her testimony
23 that some of these are needed prior to restart?

24 CHAIRMAN SMITH: But she does not understand the
25 thrust of your question, because she said certainly there

1 are some there, then she mentions several of them. I know
2 what is going to happen. At the end of all this line of
3 talk back and forth, we are going to come to a point where
4 either she cannot find a place in the report where they are
5 necessary for restart, or you are going to find a place in
6 the report where they say that nothing is necessary before
7 restart. That is where it is going to come out.

8 DR. LITTLE: I believe the thrust was that she was
9 interested in the ones that were specifically not listed as
10 being crucial, that she thought might be crucial.

11 CHAIRMAN SMITH: Yes.

12 DR. LITTLE: I don't know whether that will help
13 get where you want to go.

14 MR. BLAKE: I understand, but the reason she makes
15 the point is she says some they say are necessary for
16 restart, and then she says but they did not pay attention to
17 mine which I regard as important. And I am going to make
18 the point that they did not do that. As to the first, she
19 is wrong. And as to the second, she is going to turn out to
20 be wrong.

21 CHAIRMAN SMITH: Okay. We are not getting there
22 in any efficient way at all.

23 THE WITNESS: Am I incorrect in assuming that
24 there were some changes that were required as needed to
25 restart? You mean there are no changes that are required

1 for restart?

2 BY MR. BLAKE: (Resuming)

3 Q Mrs. Aamodt, my question is --

4 MR. BLAKE: Mr. Chairman, I may have to interrupt
5 some of her answers. The Board will have to get on me if I
6 am being too abrupt in my questioning. I will try to make
7 it more crisp and expect the answers to be more crisp.

8 BY MR. BLAKE: (Resuming)

9 Q Mrs. Aamodt, I refer you to page 2 of your
10 testimony, the bottom paragraph, the statement which says
11 "The committee considers some of these changes as needed
12 prior to restart." Is the committee you are referring to
13 there the Human Factors Review Committee?

14 A That is right, yes.

15 Q And does your knowledge of what that committee
16 considered important or necessary prior to restart or not
17 come from their report?

18 A Not directly. It comes from the kinds of things
19 that we have heard in this -- in this hearing.

20 Q You mean you have, aside from the report, you have
21 listened to gentlemen testify that there are some changes
22 necessary prior to restart?

23 A I have heard some testimony one day when we were
24 here by the -- Dr. Sheridan, Dr. Christensen, and others.
25 The -- I have also in reading through the OARP have seen

1 that -- that the -- there was some discussion there of the
2 control room.

3 Q Mrs. Aamodt, there may be discussions --

4 A There was discussion and suggestions of things
5 that should be made. I read the Kemeny Report, the Essex
6 Committee reports. They all had indicated that there were
7 major changes that were needed in the control room prior to
8 restart.

9 I just simply cannot imagine that if this
10 committee was a valid committee, that there would have been
11 no changes that they would have made prior to restart. That
12 was an assumption on my part, that since it was so strongly
13 recommended and human-factors organizations were employed to
14 find out what changes there were that were needed and the
15 consensus of all the committees was that the control room
16 was not engineered according to good human engineering
17 principles, that I would have assumed from that that there
18 were many changes that were needed prior to restart.

19 Q Did you assume that is what the committee
20 considered?

21 A I sure did.

22 MR. AAMODT: May we have a few minutes together?
23 I think you are running ahead of where my wife is keeping up
24 to you.

25 (Mr. and Mrs. Aamodt conferring.)

1 MR. AAMODT: Just a minute, Mr. Chairman. Mrs.
2 Aamodt will answer responsively.

3 (Witness reviewing document.)

4 CHAIRMAN SMITH: Well, perhaps if you had a basis
5 for the statement, perhaps overnight you can look for it and
6 come back tomorrow and identify it. Because rather than try
7 to do it under the pressure you must feel, it would be --

8 THE WITNESS: I wanted to say, Mr. Smith, that it
9 says here in the outline that is in the front of this report
10 that the report summarizes the findings of a detailed
11 engineering review of the TMI Unit 1 control room design and
12 recommends improvements based upon these findings. Now --

13 CHAIRMAN SMITH: Do you understand the point Mr.
14 Blake is trying to make? If his point is valid, say it. If
15 you don't know if it is valid, take time. If you know it is
16 not valid, give reasons for it.

17 THE WITNESS: I certainly would like to have the
18 time to examine whether the committee did indeed to make
19 recommendations. If they didn't, I will cry.

20 CHAIRMAN SMITH: That will not be necessary. You
21 can simply say that you cannot support it.

22 But why don't you go on to another question; then
23 we will come back to this one, Mr. Blake, tomorrow, to see
24 if she did have a basis for the statement.

25 MR. BLAKE: That would be fine with me. I would

1 like to avoid as well the other questions which would
2 follow, depending on where we come out on this one.

3 (Pause.)

4 CHAIRMAN SMITH: Are you then down to Item Roman
5 numeral III?

6 MR. BLAKE: I would like to go to IV.

7 CHAIRMAN SMITH: IV?

8 MR. BLAKE: Yes.

9 BY MR. BLAKE: (Resuming)

10 Q Mrs. Aamodt, I refer you to page 5 of your
11 testimony.

12 CHAIRMAN SMITH: Could I make an observation? It
13 seems to me that when you have a cross examination of
14 someone who is not familiar with litigation and cross
15 examination standards, that it might be much more productive
16 if you would just explain to Mrs. Aamodt just what bothers
17 you about a statement that she makes, and if she has made
18 the statement in error, well, maybe she will recognize
19 that. If she has a basis for it, maybe she will get right
20 to it. But I think she has a tendency to take the questions
21 that you make with a preconceived idea of what she already
22 thinks about it and not listen to it very carefully.

23 We have the same situation in reverse the other
24 day when Mrs. Aamodt was not communicating to the witnesses
25 what she was trying to achieve by her questioning. But I

1 think she went off on a tangent there when you asked her to
2 name one recommendation. You know, she did not perceive the
3 thrust of what you were getting at.

4 MR. BLAKE: No, no. In fact, the recommendations,
5 the cites to Rogovin and what not, which all looked to Unit
6 2's control room, are hardly applicable to the restart of
7 Unit 1.

8 CHAIRMAN SMITH: All right. Okay.

9 BY MR. BLAKE: (Resuming)

10 Q Mrs. Aamodt, the next line of questions that I
11 have are with regard to -- relate to the accreditation
12 business. And they all -- all of your testimony and the
13 problems you would find with trying to compare TMI-1's
14 training curriculum and facilities and the individuals
15 involved in it all stem from a comparison which you would
16 have us make for the university and the standards employed
17 by a university. They all again -- I will go back to the
18 first sentence in your testimony under this section, which
19 is: "The review committee engaged by the Licensee to study
20 the OARP was directed to apply standards used to accredit
21 engineering schools."

22 A Yes.

23 Q What is the basis of your opinion that they were
24 directed to apply the standards used as opposed to -- let me
25 stop there. Is it your understanding that they were told to

1 apply the standards used to accredit engineering schools?

2 A Yes.

3 Q Do you know whether they did? Is it now your
4 understanding that they did use the standards used to
5 accredit engineering schools?

6 A They used the -- they used -- it is at the back of
7 the OARP, what they used. They used the --

8 Q Did they use --

9 A The outline, the outline, the areas which are
10 looked at in engineering schools, they looked at, which are
11 the areas of faculty, facility, teaching format, materials,
12 and so forth.

13 Q So isn't it fair to say that what they did was
14 employ as a model what you would look at and what you would
15 use if you were trying to accredit an engineering school;
16 they used that same model and the same criteria --

17 A That was all right. Yes.

18 Q -- when -- in assessing the TMI operating program
19 --

20 A That is right.

21 Q -- training program?

22 A Yes.

23 Q But did they apply the standards or just use the
24 model to determine what particular criteria they ought to
25 look at, such as facilities, faculty, teaching format?

1 A They used a model.

2 Q Well, is the problem that you have and then list
3 in your testimony regarding faculty and facilities and
4 teaching format, et cetera, are those shortcomings which you
5 see had they applied the standards which would be used in a
6 university or an engineering school?

7 A No. Within the framework of a nuclear training
8 program, just applying the model, they found deficiencies.

9 Q Let me go down through a couple of them. The
10 faculty, nondegreed instructors. Is it your understanding
11 that that committee suggested that all the instructors
12 needed to be degreed?

13 A Well, reading what has been put together in this
14 hearing, it appears that it is now necessary for an STA with
15 a degree to be in the control room. So that it would seem
16 that those who are teaching those who are to be in the
17 control room making decisions should also at least have a
18 degree.

19 Q Is it your view that all the instructors in the
20 TMI training program should have degrees?

21 A Yes -- if indeed a decision needs to be made by
22 someone -- someone with a degree is needed for technical
23 expertise in the control room and this school is teaching
24 technical expertise, I would assume that those that were
25 teaching it should at least have as high a degree as those

1 that would be called upon to use it.

2 Q I will repeat my question for the third time: Is
3 it your position that all the instructors in the TMI
4 training program need to be degreed?

5 A I would not be able to make that judgment. I made
6 it from -- I made inferences from what other -- others'
7 judgment within this and from the material that was
8 presented.

9 MR. AAMODT: My wife makes -- Mr. Chairman, my
10 wife does not make any such -- she does not draw a
11 conclusion there. She simply states inadequacies.

12 CHAIRMAN SMITH: That is what Mr. Blake is
13 establishing.

14 MR. AAMODT: She has not attempted to draw a
15 conclusion.

16 BY MR. BLAKE: (Resuming)

17 Q Mrs. Aamodt, are these shortcomings which you have
18 described here your understanding of what the OARP review
19 committee cited as shortcomings in the training program?

20

21

22

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1 A They were all within the review.

2 Q This is just your understanding of information
3 which is included in the OARP Review Committee report.

4 A Yes. It was there either in statement or in
5 tables.

6 Q So there is none of your opinion in this.

7 A No.

8 MR. AAMODT: There is clearly a misunderstanding
9 between the two parties on this one.

10 THE WITNESS: It is my -- I would say they are my
11 conclusions from my analysis of their analysis.

12 MR. AAMODT: That is right.

13 THE WITNESS: I made an analysis of their analysis
14 to see whether their conclusions followed from their
15 analysis to see whether the bases on which they made their
16 analysis were valid. And the one table that I have included
17 in my testimony is an indication that those analyses were
18 invalid. And I made my own opinion based on the -- my
19 analysis of their analysis, that their analysis should not
20 have led them to the conclusions that they made.

21 MR. AAMODT: Which incidentally is precisely what
22 she said here.

23 I say Mrs. Aamodt stated there are several
24 detractions from the Committee's conclusions. Here they are.

25 CHAIRMAN SMITH: Well, she goes on to characterize

1 them as major faults. They would appear to be major faults.

2 THE WITNESS: Well, those are according to the
3 model of accreditation -- the facilities, the faculty, the
4 teaching format, all were to -- those were the things --
5 those were the main items to be considered.

6 CHAIRMAN SMITH: So these are not major faults in
7 your assessment of it. As you pointed out, to the extent
8 that they fall short of the model, you have termed them
9 major faults.

10 THE WITNESS: Well, for instance, the facilities
11 will be replaced, so obviously that was major.

12 CHAIRMAN SMITH: Well, we are just trying to --

13 THE WITNESS: The NRC --

14 CHAIRMAN SMITH: To follow through on Mr. Aamodt's
15 observations about your testimony. Who is saying these are
16 major faults, you or -- somebody is telling me this from
17 this written transcript.

18 (Mr. and Mrs. Aamodt conferring.)

19 THE WITNESS: I cannot put words in the mouth of
20 the Committee. I am simply restating their words. They say
21 the trailers were inadequate and not conducive to learning.
22 They say the instructors were non-degreed and some did not
23 -- had not passed NRC licensing.

24 For them to have mentioned that would appear -- he
25 would not mention like that they all had moustaches or blond

1 hair or something like that.

2 CHAIRMAN SMITH: It is your inference that those
3 are major faults.

4 THE WITNESS: I would assume if they took the time
5 and trouble to put them down, they were of some significance.

6 CHAIRMAN SMITH: I am just trying to get the
7 answer to the question. Who is this person writing here in
8 this testimony who uses the word "major faults?"

9 THE WITNESS: I believe I used that word.

10 CHAIRMAN SMITH: What we are trying to find out,
11 is this your judgment or is this the inference you drew from
12 what the Committee recommended?

13 THE WITNESS: This is an inference I drew.

14 CHAIRMAN SMITH: Okay.

15 BY MR. BLAKE: (Resuming)

16 Q And each of the subfactors are in fact inferences
17 which you drew from the Committee's report.

18 A Well, maybe I should qualify that and take the
19 time to go back tonight and find out exactly the language
20 that was used. It seems to me that a number of changes were
21 recommended, and --

22 CHAIRMAN SMITH: Is that really necessary? I
23 think that you -- I mean, whatever they recommended, they
24 recommended. I think that Mr. Aamodt has helped clarify
25 what you intended to say in your testimony. I think -- you

1 have explained the basis, I think, for concluding -- for
2 inferring that these are major faults, that they would not
3 have said it were it not so.

4 Isn't that --

5 MR. AAMODT: Yes, sir.

6 CHAIRMAN SMITH: That draws the issue, I think,
7 between the parties, doesn't it?

8 BY MR. BLAKE: (Resuming)

9 Q Mrs. Aamodt --

10 A The only one I think I would say that I would not
11 -- would not in all fairness say that I do not think -- I
12 think was more mine than theirs was the thermodynamics
13 course. That was my analysis of the thermodynamics course.
14 Otherwise, I feel the emphasis was from the reviewers.

15 MR. AAMODT: Mr. Chairman, perhaps I can clarify
16 that. I remember thermodynamics well, thank you, and I
17 remember I did not take it immediately upon entering
18 engineering school from high school. I think even to call
19 thermodynamics -- that is a very, very liberal
20 interpretation of the term "thermodynamics." And I think
21 out of this comes some trouble.

22 CHAIRMAN SMITH: I think you are not fully
23 appreciating what Mr. Blake regards as his responsibilities
24 here. I do not think it is -- Mr. Blake can state what he
25 feels his responsibilities are himself, but he just wishes

1 to establish what the basis, if any, there is for Mrs.
2 Aamodt's statements.

3 THE WITNESS: That would be the -- the causes
4 would be -- they would have been considered major, all the
5 others except this content by the review committee, except
6 the content, and that one I figured out from consulting with
7 my husband who is an engineer, too, and made my own
8 evaluation on that on that basis. And I have also been
9 cross questioning on that.

10 BY MR. BLAKE: (Resuming)

11 Q Mrs. Aamodt, let me describe to you the nature of
12 my problem on this and see if we can -- it is my
13 understanding that the OARP Review Committee came to Three
14 Mile Island and reviewed the OARP program. When they got
15 there they could not find -- there were not standards
16 directly applicable, but they decided to use as a model the
17 university -- engineering school of a university standards,
18 and they looked at that as a model. That told them look at
19 this item such as facilities, look at this item such as
20 faculty, look at this item such as texts or course
21 materials, course content; and that is what they did. And
22 that is my understanding of what the OARP Review Committee
23 report says.

24 Is that clear so far?

25 A Yes. I am in total agreement with you, Mr. Blake.

1 Q Okay. Let me go to the next step.

2 Now, you take their report and then find fault
3 with the facilities, the faculty, the teaching format, the
4 materials, etcetera, in your analysis of their analysis,
5 which is the terminology you have used. But you put them up
6 against the standards.

7 My understanding of your testimony is you would
8 have the TMI training program compared against the standards
9 which you would use to accredit a university engineering
10 school. Is that what you want to do?

11 A No, no, no, that is not true. I am thinking of it
12 -- let me explain. For instance, the faculty who teaches a
13 course in thermodynamics in an engineering school is
14 generally a Ph.D. Now, that is -- I mean, who teaches a
15 course in thermodynamics any place? What is
16 thermodynamics?

17 Is this term "thermodynamics" as I understand it
18 or my husband understands it? Thermodynamics evidently is
19 not maybe a descriptive program.

20 Q Let me stop you right there. In an engineering
21 school I agree it might be taught by a Ph.D. Would you
22 fault the TMI program for not having it taught by a Ph.D?
23 Would that make the TMI program inadequate in your view?

24 A Well, I think to use the term "thermodynamics" --

25 Q Let me just use -- let me see if we can do it with

1 yeses and noes.

2 Would, in your view, not having a Ph.D. teach
3 thermodynamics to the TMI-1 operators make their training
4 program inadequate, yes or no?

5 A Yes.

6 Q In your view, in not having facilities at Three
7 Mile Island for training operators which were comparable to
8 or rose to the standard of the model which is used to
9 accredit engineering, university engineering schools, make
10 the facilities inadequate, yes or not?

11 A According to me?

12 Q Yes.

13 A I think I said, Mr. Blake, that thermodynamics was
14 the only one that I made my individual appraisal on. All
15 the others I did not make that; they made that. I did not
16 see the facilities. I do not know what kind of facilities
17 are needed for training at nuclear engineering -- nuclear
18 power plant operators. They said the facilities were
19 inadequate to learning.

20 Mr. Blake, my initial look at whether the report
21 came to the correct conclusion was on the basis of the test
22 results. I went back from there. And if you set out to
23 teach something and you have not taught it, what is wrong.
24 And I looked to find out what the committee thought was
25 wrong. The committee thought those things were inadequate.

1 CHAIRMAN SMITH: Mr. Blake, I think she has stated
2 at least once now -- well, let's find out. Except for
3 thermodynamics, after consultation with Mr. Aamodt, do you
4 have any judgment of your own, any opinion of your own as to
5 whether these are detractions from the committee's
6 conclusions?

7 THE WITNESS: Yes, they are detractions from their
8 conclusions.

9 CHAIRMAN SMITH: My question is you do not have
10 any of your individual, your own judgment. You have
11 repeatedly stated that you have made inferences from the
12 committee's own recommendations and not -- you do not have
13 any judgment as to -- well, when a specific item comes up,
14 you say I do not know; I just took it from the committee.

15 Let's take each of them: a) facilities. Do you
16 have your own judgment as to whether that is a detraction,
17 based upon your own judgment, not based upon what the
18 committee conclusions were?

19 THE WITNESS: I have not seen the facilities, and
20 so that --

21 CHAIRMAN SMITH: So you do not have --

22 THE WITNESS: I would have no basis to judge.

23 CHAIRMAN SMITH: Faculty -- do you have any
24 knowledge of your own?

25 THE WITNESS: Yes, I do, from my own teaching and

1 learning experiences.

2 CHAIRMAN SMITH: Teaching format?

3 THE WITNESS: Against my own experiences and
4 psychological studies and also the committee.

5 CHAIRMAN SMITH: The materials.

6 THE WITNESS: Dependent upon the committee,
7 entirely on that.

8 (Board conferring.)

9 MR. AAMODT: Mr. Chairman, the point my wife is
10 trying to make, which I think has been obscured, is that the
11 committee made -- drew a conclusion. And in the text of the
12 material supporting that conclusion, there was material that
13 argued against their conclusion; and she simply tried to
14 make that point.

15 CHAIRMAN SMITH: However, now she has -- that is
16 what I understood her to be saying, but now she has made the
17 answer quite different.

18 MR. AAMODT: And she has her own opinions, too.

19 CHAIRMAN SMITH: All right, all right. But Mr.
20 Blake is entitled to know just exactly how much basis there
21 is to these statements. The reason I seem to be getting a
22 little bit eager to conclude this is because I do not see
23 how this is going to carry through in the proposed findings.

24 If Mrs. Aamodt wishes to make proposed findings
25 along the order of that statement beginning with the

1 following detractions, she is going to have to point to the
2 record. And if it is going to be a record citation to the
3 report -- in the first place, if she points to her own
4 testimony, she is going to have trouble right there.

5 MR. BLAKE: That is what I was trying to establish.

6 CHAIRMAN SMITH: I know, and this is what occurred
7 to me, that we should be talking about if you try to come up
8 with a proposed finding which says that the detraction of
9 the committee's conclusions is, a) bad facilities, and if
10 the record citation you give is the testimony of Marjorie
11 Aamodt, well, that is not going to be real good reference
12 support if you give citation to the record some place while
13 we look at that. If we look at the record support, the
14 record citation and it is not there, we will not adopt that
15 finding.

16 On the other hand, if Mr. Blake comes back, if you
17 make that, and then on reply findings he points to a place
18 in the record where it would indicate that you did not have
19 support for that, that the contrary was the case, then we
20 would go to those findings and make our own judgment.

21 THE WITNESS: I understand that. I said a number
22 of things here that cannot be backed up. Most are the CARP.

23 CHAIRMAN SMITH: It seems to me the extent of your
24 bases has been thoroughly explored now, unless he wants to
25 go into your judgment as an educator. I don't know. That

1 is another matter. It is up to him.

2 But as far as taking it from the evidentiary
3 record, it seems to me that she has pretty well stated how
4 she arrived at that.

5 MR. BLAKE: Mr. Smith, I will go on to the next
6 topic.

7 CHAIRMAN SMITH: Beg pardon?

8 MR. BLAKE: I will go on to the next and last
9 topic for today.

10 CHAIRMAN SMITH: Mr. Blake, I do not want to stop
11 you in this line of questioning, but it does seem like we
12 have been around the circle on it several times until the
13 last circle where she began to insert her own expertise as a
14 teacher. That was new, I will concede. Otherwise, I think
15 she has very well established that except for thermodynamics
16 she is inferring this; she is construing and inferring from
17 the committee itself. And if that inference is valid, she
18 can point to the record where it is. If it is not valid,
19 you can point to the record where it is not, or you can
20 point to her failure to point to the record.

21 (Laughter.)

22 I mean, whatever you want to do. Haven't we
23 ventilated this issue quite a bit?

24 MR. BLAKE: I have had enough on this subject.

25 CHAIRMAN SMITH: Okay. And we do not require any

1 more.

2 BY MR. BLAKE: (Resuming)

3 Q Mrs. Aamodt, referring to the bottom of page 5,
4 the quote which you have there which carries over to the top
5 of page 6, you cite that as being from page 58 of the OARP
6 Review Committee report.

7 Can you turn to page 58, please?

8 (Witness reviewing document.)

9 Do you have that page?

10 A Yes, I do have it.

11 Q Mrs. Aamodt, you have cited this sentence which
12 points to a problem observed by the committee. Are you
13 aware whether or not that problem was observed by others or
14 corrected or not?

15 A I observed that it was observed and action was
16 taken. Whether it was corrected or not, I am not sure.

17 Q But you are aware of the remainder of the
18 paragraph which you have cited, what action was taken.

19 A "Correction" implies a positive effect, and I do
20 not think there was evidence of that.

21 Q Is there evidence that it did not correct it?

22 A Well, there was an assumption in there in which
23 programs they reviewed. If you look at the last table,
24 Table 2, of my testimony, the rating of instructors by
25 backup instructors as a function of quiz results, now, those

1 two items should be related.

2 If you -- isn't that what we are judging the
3 teachers on is how well they have taught the subject, and
4 aren't the quizzes in fact an evidence that the subject was
5 well taught? So you should have a positive relationship --
6 the higher the teacher's rating, the higher the grade. And
7 there is no relationship, no definable relationship between
8 the two variables.

9 So instructor ratings on which basis the program
10 was reviewed, it was not a legitimate basis for deciding
11 which parts to review; so I do not -- there was an action.
12 Whether it was a corrective action is up in the air.

13 Q Mrs. Aamodt, have you reviewed, other than the
14 characterization of this technique of reviewing instructors,
15 have you reviewed any of the evaluations done of the
16 instructors?

17 Are you familiar with the evaluations that were
18 done?

19 A I understand it was done by the backup instructor
20 and was -- a score was given, with three being good and four
21 being excellent. A score below three, good, was considered
22 serious. I believe that you would have a bias when the
23 person who was doing the rating is in such close
24 relationship to the person who is being rated. And also,
25 what are the qualifications of the rater? Is this now

1 someone with -- a non-degreed person or with a B.S. degree
2 who not only is able to teach these courses but able now to
3 rate people on how they teach these courses?

4 Q Mrs. Aamodt, have you reviewed --

5 A That is another area of expertise, rating is.

6 Q My question is have you reviewed any of the
7 evaluations done?

8 A I have only had access to the review committee's
9 review, but I am -- this is an area in which I do have some
10 expertise. I have worked in the area of setting up
11 experiments to prove things. I can also look back the other
12 way at a conclusion and see whether the evidence that was
13 given does not support the conclusion.

14 Q Mrs. Aamodt, have you reviewed any of the
15 evaluations done? Have you looked at any of them?

16 A I've said, Mr. Blake, no.

17 Q Thank you.

18 This is one of the areas of your expertise?

19 A The area --

20 Q Evaluating instructors?

21 A Being able to decide from the evidence presented
22 whether the conclusion, statistical evidence presented with
23 the conclusion drawn is valid.

24 Q Is evaluating instructors an area in which you
25 regard yourself as expert?

1 A That has nothing to do with that, my expertise.

2 Q Mrs. Aamodt, please answer the question.

3 A You are asking me a question like when did you
4 stop beating our wife.

5 Q No.

6 CHAIRMAN SMITH: Excuse me. He is entitled to the
7 answer. Then you can explain. But he is entitled to the
8 answer.

9 THE WITNESS: Could you repeat the question?

10 BY MR. BLAKE: (Resuming)

11 Q Do you regard yourself as an expert in the area of
12 ranking or grading instructors?

13 A What has that got to do with --

14 MR. AAMODT: May we have --

15 CHAIRMAN SMITH: This is not your testimony, is
16 it, Mr. Aamodt?

17 THE WITNESS: I need an interpretation of the
18 question by my husband. I have difficulty.

19 CHAIRMAN SMITH: If you feel the answer cannot be
20 answered, all right; unless you have further explanation,
21 that is all right.

22 THE WITNESS: I object to it, Mr. Smith. Why do I
23 have to know how to operate a nuclear power plant to rate
24 instructors, to be able to look at rating of instructors?

25 CHAIRMAN SMITH: Exactly as we require witnesses

1 hour after hour after hour to answer your questions so that
2 you could make your case. Mr. Blake is entitled to have
3 your answers on what your expertise is. It is the same
4 thing.

5 THE WITNESS: All right. Can I rate nuclear power
6 plant instructors, is that right, or do I know how to rate
7 instructors?

8 CHAIRMAN SMITH: That is not the question. Well,
9 I guess -- do you have expertise on how to rate instructors?

10 THE WITNESS: How to rate instructors, yes.

11 CHAIRMAN SMITH: All right.

12 BY MR. BLAKE: (Resuming)

13 Q Mrs. Aamodt, where did you achieve your expertise
14 in how to rate instructors?

15 A From studies in psychology.

16 Q Studies in psychology on how to rate instructors
17 or --

18 A Yes.

19 (Pause.)

20 CHAIRMAN SMITH: Now, in all fairness, Mrs. Aamodt
21 also said that that question was also based upon her
22 training in statistics, that she could apply the general
23 field of statistics to another field and see if it makes
24 statistical sense. I think that was part of her --

25 THE WITNESS: That would be, yes, yes, the

1 analysis.

2 CHAIRMAN SMITH: I think this would be a good
3 point.

4 THE WITNESS: I mentioned the psychological
5 principle in not rating. You would not have someone who was
6 biased. You would not have my mother rating me on my
7 performance today, for instance. She would say terrific,
8 right? You do not have someone who is rating you who is in
9 a biased position to you.

10 A backup instructor is essentially living with an
11 instructor in a work situation. So, number one, that is
12 just a principle. If it is not apparent to you, it comes
13 out of my background of psychological knowledge.

14 MR. BLAKE: Were you suggesting that we stop here,
15 Mr. Smith?

16 CHAIRMAN SMITH: Yes. I was sort of begging for
17 it. It has been a long day.

18 (Laughter.)

19 It has been a long day.

20 (Laughter.)

21 MR. BLAKE: I am not opposed.

22 (Laughter.)

23 CHAIRMAN SMITH: All right. We will break tonight
24 until 9:00 a.m.

25 Just a moment.

1 MR. BLAKE: Not related to continued cross
2 examination, we did have some items to hand out and note on
3 the record.

4 CHAIRMAN SMITH: Did you say not on the record?

5 MR. BLAKE: "Note on the record." One of them is
6 --

7 CHAIRMAN SMITH: Just a moment. Obviously we will
8 not be able to begin with Mr. Moseley at 9:00, or is it your
9 plan -- would your plan be to have some other arrangement?

10 MR. SWANSON: He is not coming up until tomorrow
11 morning, so if we could come up with a rough estimate, I
12 think I could get ahold of him at home tonight.

13 CHAIRMAN SMITH: Certainly he does not have to get
14 out of bed at the crack of dawn to be here. I would say
15 that if he is here at the mid-morning break that he
16 certainly would not delay the proceedings.

17 MR. SWANSON: Fine.

18 CHAIRMAN SMITH: That is helpful?

19 MR. SWANSON: Yes, that is helpful. Thank you.

20 THE WITNESS: Mr. Smith, is it never done that the
21 testimony is interrupted, and Mr. Moseley goes ahead, and
22 then I am taken after Mr. Moseley?

23 CHAIRMAN SMITH: Certainly, it is done. It did
24 not occur to me because I did not think you would favor that
25 idea.

1 THE WITNESS: I would.

2 MR. SWANSON: The problem with that is Mr. Moseley
3 also wanted to address at least one Board question on the
4 importance of comparing LERs and the SALP program. If that
5 could be separated out from other specific questions about
6 the analyses done on the LER comparison, perhaps we could
7 get him on and off the stand.

8 CHAIRMAN SMITH: I think if you can work out among
9 the parties; otherwise, we should continue -- if you can
10 make an arrangement, that is fine; but you should continue
11 with the cross examination, because if you have to wait
12 until the end of Mr. Moseley's examination, it may be too
13 long. But there must be a full opportunity for complete
14 cross examination. Otherwise, your testimony cannot be
15 received.

16 THE WITNESS: I am anxious to have a full
17 examination, but I thought we would have finished today. I
18 have a child who has a very bad sore throat, and I have been
19 away from him the entire time he has been ill, so I was just
20 thinking -- you know my difficulties in getting here at 9:00
21 because of the traffic and also the train comes late. So I
22 just thought I have to me this extraordinary effort to be
23 here by 9:00 where it is just a super effort to get here by
24 9:30 or 10:00.

25 CHAIRMAN SMITH: Mrs. Aamodt, we do it from over

1 100 miles away on a regular basis, and believe me, the
2 traffic we go through is awesome. You just will have to be
3 here at 9:00 unless you can work something else out.

4 THE WITNESS: I will be here at 9:00 if the Board
5 so orders, but I just thought if someone from Washington was
6 planning to come at 9:00 that you would not be imposing on
7 me to push my schedule back.

8 CHAIRMAN SMITH: Well, if you can work it out
9 among the other people, do it. Otherwise, we will resume
10 your testimony tomorrow at 9:00.

11 MR. SWANSON: Mr. Chairman, that brings me back to
12 my point. I don't see any problem in working something out
13 provided it seems reasonable -- and I realize this is a
14 problem in predicting -- it seems to be reasonable to the
15 Board to be able to separate out -- well, it is easy to
16 separate out, number one, the I&E report.

17 The second thing I mentioned Mr. Moseley would
18 probably be the best person to testify on is the bottom line
19 question that the Board had about the value of comparing
20 LERs. If he could perhaps answer that general question, and
21 if you had questions about the SALP program which could then
22 be perhaps separated out from the rest of the panel, which
23 may well come up at the end of the day or I guess even
24 Wednesday or Thursday, that would be all right.

25 CHAIRMAN SMITH: All right. I have perhaps a half

1 hour of questions, if that much, on the LERs and the
2 non-compliances, if that much. I don't know about anybody
3 else. I think Mr. Dornsife indicated some. But this is an
4 area where the Board has not -- so the Intervenors -- if
5 that can help you plan.

6 MR. SWANSON: Maybe. I guess I was not being very
7 clear. We have the individual authors of the analyses that
8 are in the SER, the evaluation report supplement. I do not
9 understand that there was any problem, a conflict with their
10 schedules. If it takes to the end of the day to get to
11 them, that is fine.

12 The only question about asking Mr. Moseley to come
13 up first thing in the morning is that if -- he has two
14 sections he can testify on. If he could combine those two,
15 then I do not see any problem in working out an
16 accommodation with Mrs. Aamodt about his coming up first.

17 CHAIRMAN SMITH: Which two?

18 MR. SWANSON: The I&E report, which there is no
19 problem on. The other thing is although he did not do the
20 specific analysis of the LER and the enforcement history
21 comparisons, he might be in one of the best positions of the
22 members of the panel to comment on the Board's bottom line
23 question about the value of that in making conclusions about
24 management capability, and following up on that about the
25 SALP program which was mentioned briefly.

1 Then if the Board wanted to get into specific
2 questions about the analysis, that could be done by the
3 specific authors of those. That could be done later on.

4 CHAIRMAN SMITH: I see. Okay.

5 MR. SWANSON: If that does not present a problem
6 with the Board, I'm sure we can work out something with Mrs.
7 Aamodt.

8 CHAIRMAN SMITH: How about you, Mr. Blake?

9 MR. BLAKE: Was that all in favor of having Mr.
10 Moseley go right on first thing in the morning?

11 CHAIRMAN SMITH: Yes.

12 MR. SWANSON: Yes.

13 MR. BLAKE: I have no problem with that. It was
14 my understanding we were going to interrupt, no matter where
15 we were, and have Mr. Moseley come on tomorrow.

16 CHAIRMAN SMITH: I did not understand that that
17 was the case. Okay. Then I think it can be safely said
18 that you do not have to be here until 10:30.

19 THE WITNESS: That would be fine. Thank you very
20 much, Mr. Smith.

21 CHAIRMAN SMITH: How is that?

22 MR. BLAKE: Yes.

23 CHAIRMAN SMITH: All right. We will adjourn then
24 until 9:00 a.m. tomorrow.

25 MR. BLAKE: Mr. Smith.

1 CHAIRMAN SMITH: Oh, they have -- all right.

2 MR. BLAKE: I wanted to identify that we are
3 providing copies of Licensee's response to ANGRY's request
4 for reconsideration of its motion to adopt Mr. Sholly's
5 emergency planning contentions. I am providing an answer to
6 the Board's question on the sample year of 1978, which we
7 have distributed. That is another maintenance one, Dr.
8 Jordan.

9 CHAIRMAN SMITH: Okay.

10 MR. BLAKE: And I have one inquiry with regard to
11 the format tomorrow morning for Mr. Moseley. I do not
12 understand whether he is going to be a sworn witness
13 appearing here at the Board's request and subject to cross
14 examination by all parties, or you want to talk with him in
15 the nature of satisfying yourself.

16 I do not understand what the format is, Mr. Smith.

17 CHAIRMAN SMITH: Well, we have not really thought
18 of a highly structured format. To me, it is more in the
19 nature of a counseling from the staff of what -- how -- what
20 the Board should be looking for. It is more of a briefing.
21 However, looking through some of the papers I see that Mr.
22 Moseley was a very active participant in these events, too.
23 So it may very well be we would want the briefing under
24 oath, but the basic idea is the Board does not know what
25 these documents hold in store for the hearing. We do not

1 know what the Staff wants us to do with them. We do not
2 know --

3 One of the questions I am going to ask him is
4 looking at the two documents, the Udall committee report and
5 the Staff committee report, can you point out to us where
6 the Udall committee had a different body of evidence than
7 the staff had at arriving at its conclusion. Where is it?
8 Is it different? What was the concept of their
9 investigation?

10 We don't know anything yet about these reports.

11 MR. BLAKE: Is it only these two which you
12 anticipate, or the President's Commission, the Rogovin
13 Commission? They all looked at the same topic, the same
14 subject.

15 CHAIRMAN SMITH: The Board has --

16 MR. BLAKE: I am trying to get a feel for who has
17 looked at this and what is involved.

18 CHAIRMAN SMITH: The Board has two, what appear to
19 be inconsistent papers, one that we have before it, the
20 Staff's report on the information flow, and the other which
21 I have just seen an extremely crude draft of, and that is,
22 the Udall committee arrived at a conclusion different from
23 the staff.

24 Now, we want to know two things. One is what does
25 the Staff intend to do in this hearing with its own report,

1 what do they want to tell us about that investigation? Is
2 it a basis to conclude that there is inadequate management?

3 And then we want an explanation, if possible, of
4 just generally what does the Udall committee report say. I
5 mean, did they have a different approach? Did they have a
6 different investigation? Is that a different body of facts,
7 a different body of information?

8 We cannot really run through it all ourselves. I
9 mean, we just cannot do it. So Mr. Moseley is familiar with
10 it, so we thought he could tell us about it.

11 Now, if we think there are questions that we might
12 ask of him that are prejudicial to your client, then you
13 certainly should feel free to object, you should, and we
14 will not preclude that. But we have to have an entry into
15 this problem some way.

16 The way it stands now, plop, here are some papers,
17 and people walk away from the papers and leave it for the
18 Board to work out. Well, that is not going to happen.

19 MR. BLAKE: Okay.

20 CHAIRMAN SMITH: That is not going to happen. We
21 are going to be told what we should do about the papers. We
22 may not agree, but at least we are going to be informed what
23 the Staff and whomever wishes to participate believe should
24 be done about the papers, as opposed from an evidentiary
25 hearing on the subject matter of the papers.

1 Does that help?

2 MR. BLAKE: Yes, that is helpful. I wanted at
3 least some explanation for how we might proceed tomorrow or
4 what we might anticipate in either an opportunity for
5 questions or what you would expect from Intervenor or what
6 not in the way of questions of Mr. Moseley, whether or not
7 an opportunity would exist. I just was not sure.

8 CHAIRMAN SMITH: We will be very sensitive to your
9 need to protect your client, and the fact that you are
10 entering now upon unknown grounds, you don't know what is
11 going to happen, nor do we. But we are aware you have a
12 client to protect.

13 MR. BLAKE: Okay.

14 CHAIRMAN SMITH: Okay. Anything further?

15 (No response.)

16 All right. Let's adjourn until 9:00 a.m.

17 (Whereupon, at 5:47 p.m., the hearing was
18 recessed, to be reconvened at 9:00 a.m., the following day,
19 Wednesday, February 18, 1981.)

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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

in the matter of: METROPOLITAN EDISON COMPANY (TMI UNIT 1)

Date of Proceeding: February 17, 1981

Docket Number: 50-389

Place of Proceeding: Harrisburg, Pa.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

David S. Parker

Official Reporter (Typed)



Official Reporter (Signature)