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NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

DUKE POWER COMPANY

(Oconee-McGuire)

Docket No. 70-2623

Place - Charlotte, North Carolina

Date - 25 June 1979

Pages 1402 - 1631

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the matter of:	
DUKE POWER COMPANY	Docket No. 70-2623
(Amendment to Materials License SNM-1773 for Oconee Nuclear Station Spent Fuel Transportation and Storage at McGuire Nuclear Station)	

Board Room, Fourth Floor,
Mecklenburg County
Administration Building,
720 East Fourth Street,
Charlotte, North Carolina.

Monday, 25 June 1979

The hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 9:00 a.m.

BEFORE:

MARSHALL E. MILLER, Esq., Chairman,
Atomic Safety and Licensing Board.

DR. EMMETH A. LUEBKE, Member.

DR. CADET H. HAND, Member.

APPEARANCES:

On behalf of the Applicant:

J. MICHAEL McGARRY, III, Esq.,
Debevoise & Liberman,
1200 Seventeenth Street, N.W.,
Washington, D.C. 20036

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WILLIAM LARRY PORTER, Esq.,
Associate General Counsel,
Duke Power Company
Charlotte, North Carolina

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On behalf of the Regulatory Staff:

EDWARD J. KETCHEN, Esq.,
RICHARD K. HOEFLING, Esq.,
Office of the Executive Legal Director,
United States Nuclear Regulatory Commission,
Washington, D.C. 20555

On behalf of the State of South Carolina:

RICHARD P. WILSON, Esq.,
Assistant Attorney General,
Office of the Attorney General
State of South Carolina
2600 Bull Street,
Columbia, South Carolina 29201

On behalf of Intervenor Carolina Environmental Study Group:

SHELLY BLUM, Esq.,
Blum & Sheely,
730 East Trade Street,
Charlotte, North Carolina 28202

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P R O C E E D I N G S

CHAIRMAN MILLER: Our evidentiary hearing will resume.

I believe we have a witness on the stand.

MR. MC GARRY: We do, Mr. Chairman. But before that I would just like to make a statement for the record.

Pursuant to the occurrence on Saturday with respect to Dr. Garrick and the Applicant's Exhibit 11, which was the document we offered which we maintain supports Dr. Garrick's testimony, we have had discussions with CESG and pursuant to the discussions, CESG will be able to cross-examine Dr. Garrick any time after Wednesday, I believe we decided on Friday to accommodate CEGS.

The Applicant is waiving its objection to Mr. Riley cross-examining Dr. Garrick, Mr. Sterrett, and Mr. Lewis.

We simply do that to facilitate what we understand is CESG's preparation. And I wanted to make that statement on the record. We know that's the Board's province to make that decision, but we're simply stating we're waiving our objection.

CHAIRMAN MILLER: All right, you made your statement.

MR. MC GARRY: I would like to call Applicant's witness --

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MR. KETCHEN: May I comment?

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b3 will not be waive, if this is the appropriate time to make that statement.

CHAIRMAN MILLER: It's an appropriate time to make statements.

Proceed.

MR. MC GARRY: Dr. Hamilton.

Whereupon,

LEONARD D. HAMILTON

resumed the stand on behalf of the Applicant and, having been previously duly sworn, was examined and testified further as follows:

MR. MC GARRY: Mr. Chairman, I believe I have several further questions I would like to ask Dr. Hamilton at this time.

CHAIRMAN MILLER: Yes, you may.

MR. MC GARRY: Thank you, Mr. Chairman.

DIRECT EXAMINATION (Continued)

BY MR. MC GARRY:

Q Dr. Hamilton, at our session on Friday I believe you stated that you would be concerned with any activity that would result, on a regular annual basis, in routine doses that approached natural background radiation. Is that correct?

A That's right, from any stage of the nuclear fuel cycle, yes.

Q What is natural background?

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A Natural background --

Q In North Carolina and South Carolina, what are those levels?

A Natural background in North Carolina is 145 millirem a year, and in South Carolina, 135 millirem a year.

Q Dr. Hamilton, on an annual basis, what are the routine doses associated with the transportation activity in question?

A With the transportation activity in question, for the 400 shipments from Oconee to McGuire, 400 shipments, the total person-rem, occupational and to the public, are 16 person-rem.

The dose to the population, to the 42,000 people who live within 0.5 miles of the route, is 0.13 person-rem.

The dose to any individual from those 400 shipments is 0.003 millirem.

Could I make one additional point?

We're talking about 400 shipments and during the hearing, I have gathered that it is not the intention to ship in any one year more than 300 shipments, so that one needs to adjust the 0.003 millirem to the corresponding figure which I calculated would be 0.0232 millirem.

Q Dr. Hamilton, the dose you have just referred to, is that for the discrete part of the transportation activity as opposed to the loading and unloading operations associated

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ab4 with the entire transportation activity?

A Correct. The other doses refer to the loading and unloading, and also to the doses related to the storage.

Q Dr. Hamilton, in the context of the total transportation activity, I believe you stated that Mr. Lewis furnished you dose figures. Is that correct?

A That's correct.

Q If those figures were changed by an order of magnitude, would that change your testimony as it relates to this transportation procedure?

A No. The effects that I've calculated are extremely small. They're in the record. And ten times an extremely small figure, I mean for all intents and purposes, they're practically zero, ten times would make no difference.

Q Dr. Hamilton, have you based your testimony with respect to routine releases solely upon the doses and information you received from Mr. Lewis?

A No. As I believe I testified on Saturday, I'm involved in assessing the health and environmental impacts of all energy sources, and in previous assessments that I made on the nuclear fuel cycle, I have assessed the doses contributed by the transportation of spent fuel and for that matter, other materials in the nuclear fuel cycle, and have arrived at figures derived from the literature which are very similar to those provided to me by Mr. Lewis. 405 008

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Q Dr. Hamilton, with regard to the accident release and the health effects associated with the accident, I believe you stated that you've relied upon testimony of Dr. Garrick. Is that correct?

A I relied, yes, partly on testimony of Dr. Garrick in what I stated.

Q But you did not rely solely on Dr. Garrick's testimony; is that correct?

A No. AGain, I rely on my experience in assessing the impacts of the nuclear fuel cycle, and I have previously gone on record with the estimates that I've calculated from the literature available to me up until June last year, and I've come out with a calculation.

I have also relied on the Environmental Impact Appraisal and the Staff's maximum accident calculation actually derived from these, in addition to our derivation from Garrick estimates which clearly, as I stated on Saturday, fall within the same ballpark.

As a matter of fact, the estimates that I derived from Dr. Garrick's work-- I felt it was convenient to use Dr. Garrick's work because he was -- his results were individualized to this particular site as distinct from being generic. They dealt with the population, meteorology and the road conditions in this area. And --

MR. BLUM: Objection to that c aracterization of

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Dr. Garrick's work. I will accept that he has relied on it to that extent, but insofar as he's characterizing something that is not yet in evidence, not yet presented, I don't want that to be anything anyone can rely on at this point.

CHAIRMAN MILLER: Yes. Well, we'll strike any characterization of Dr. Garrick's testimony as not being in evidence. Is that your point?

MS. BLUM: Yes.

CHAIRMAN MILLER: Yes.

So far as the extent of your reliance, if any, on any information or data stemming from Dr. Garrick, you could indicate the extent of that as it is relevant to your own testimony.

THE WITNESS: Well, I wanted to explain why I felt it reasonable to use Dr. Garrick's estimate.

CHAIRMAN MILLER: Well, no, that we will strike. Dr. Garrick's testimony and evidence is not yet in evidence. You are therefore anticipating.

THE WITNESS: Can I have some guidance?

CHAIRMAN MILLER: I take it the conclusions of the witness are not dependent upon that aspect of Dr. Garrick's testimony and evidence, is it?

MR. MC GARRY: That's correct, Mr. Chairman.

CHAIRMAN MILLER: Very well.

BY MR. MC GARRY:

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Q Dr. Hamilton, did your use of the Environmental Impact Appraisal as well as other information that is contained within your data base confirm the information you relied upon that you obtained from both Mr. Lewis and Dr. Garrick?

A That is correct.

Can I give you one example?

From the Environmental Impact Appraisal produced by the Staff I have calculated in detail the results from the extra severe transportation accident and taking into account the probability of this accident given bythe Staff on page 35, they say:

> "The probability of this accident occurring during during any year, assuming 300 shipments of 170 miles each, is 4.2×10^{-8}."

Taking the doses from Table 6.3 on page 38, I have calculated at population center B for the total dose commitment in man-rem for whole-body radiation, that is, the highest possible figure, a cancer incidence of 4.2×10^{-9} to 6.3×10^{-9}.

I want to point out to you that those figures are far less than those I have given on the Garrick, which encompasses all accidents in which the incidence was 7.2 to 10.8×10^{-4}.

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So I have satisfied myself from the Environmental

ab8 Impact Statement that the calculations we provide are most conservative.

Furthermore, in the process of my assessment activity, I have also had access to established documents, and I would like just to refer to the United Nations Scientific Committee on the Effects of Atomic Radiation, their 1977 report. This is recognized as one of the most authoritative international reports on the subject of radiation, and they give very precise statements about the doses to be expected from the transportation of fuel and the contribution of accidents to those doses.

And again, this international consensus supports the analysis that I have made.

There's a similar statement in this document that I've been asked to review by the Quarterly Review of Biology. This is published by the World Health Organization, and it's an analysis of a special group on the health implications of nuclear power production. And there is one statement-- It says:

> "On the basis of experience and the assessment studies made, the working group consider that public health risks from transport of spent fuel are very small."

And that's on page 42 of this document.

Thank you.

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Q Dr. Hamilton, the documents that you've just made reference to, they are the type of documents, are they not, that a person in your position continually relies upon for opinions and judgments. Is that correct?

A Correct.

MR. MC GARRY: No further questions of the witness, Mr. Chairman.

CHAIRMAN MILLER: You may cross-examine.

MR. BLUM: Yes, sir.

CROSS-EXAMINATION

BY MR. BLUM:

Q Dr. Hamilton, if you will, look at your testimony; page 9 I believe would be a good page to start off at.

You have some numbers in the second paragraph, 0.9×10^{-6} to 1.6×10^{-5}. Can you give me the confidence limits on those numbers?

A Yes. These are the-- You are referring to my calculation on the cancer rates --

Q Yes, sir,

A -- in the population of 42,000 people living within 5 miles of the route?

The confidence intervals I could calculate from the risk estimate as these represent the upper limit of risk, and at the bottom end of those confidence limits it would be zero. This is as far as the risk estimate is concerned.

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ab10 Because most of the irradiation, by far the greatest part of the irradiation, to be expected to be emitted from spent fuel would be beta and gamma radiation. This is referred to as low LET, low energy transfer radiation, and there is overwhelming evidence in the literature that the application of the linear hypothesis in calculation of the risk of low LET radiation, low energy transfer radiation, exaggerates the risk by as much, in some experimental studies, as a factor of 10, and it's highly likely that a factor of 5 would be a reasonable adjustment.

In other words, these figures should more reasonably be probably 5 times too high rather than anything else.

I regard these figures as far as their damage function is concerned as an upper limit of risk.

Now I did not calculate myself the number of people who reside in this area. That was a figure I was given, and I cannot speak with any confidence as to the accuracy of that figure. But as far as the dose and the damage function that I calculated, those represent the upper limit of risks. And I think it is very important that people should understand that, that those are tiny numbers and the effects could be zero.

Q I don't think you've answered me in terms of how reliable the statistical -- how reliable statistically these numbers are. I mean you made a calculation. You've got to

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ebll have some estimate of the range of the accuracy. What is the probability of it actually falling within this number, these two numbers?

MR. MC GARRY: Mr. Chairman, I believe the witness has answered. He stated that was the upper --

CHAIRMAN MILLER: He gave certain ranges, as I recall his answer, which may or may not be satisfactory to you, but I believe the answer did purport to give ranging from zero to some particular figure. I think he's answered. I think you may inquire further if you wish, but I don't think you can disclaim the answer as being wholly unresponsive.

MR. BLUM: What I'm attempting to determine is what is the probability that the number is between 0.9×10^{-6} and 1.6×10^{-5}.

CHAIRMAN MILLER: Can you answer that, Dr. Hamilton?

THE WITNESS: Can I say I frankly don't understand the question.

CHAIRMAN MILLER: All right, stop. I don't want you to guess. If you don't understand it you don't understand.

Please, Intervenor, rephrase the question or--

THE WITNESS: Can I explain?

CHAIRMAN IMILLER: No, you are not to lecture. You are to answer questions. Let him pose the question.

.a Next question.

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BY MR. BLUM:

Looking down to the next to the last line of that paragraph, you've got genetic effects from natural background radiation as falling between 0.04 and 0.7 roughly. It's on page nine.

A That's a different paragraph.

Q No, it's the same -- well, whatever.

Do you see where I'm referring to? "The corresponding genetic effects from natural background radiation would be 0.0412?"

A Yes.

Q All right.

Now, can you explain that large range?

A Well there's great uncertainty in calculating genetic effects. For example, there's some uncertainty in calculating the somatic effects, induction of cancer. But there's much greater uncertainty in calculating genetic effects.

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Q All right.

A Most of these genetic effects, in fact, all of these genetic effects have been calculated by extrapolations from animal experiments, there are no direct data that gives us dose-effect relationships on genetic effects in man, and there's a whole host of studies in animal experiments. And these are taken from the BEIR estimates. And this range

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reflects the extrapolation that one has to make from varied animal experimentation results because it's the only way we can proceed.

We make the basic assumption that the genetic material in man, the DNA and protein, are essentially similar to those in various experimental animals. And taking experimental animal results, we have a very wide range of possible dose-effect estimates that one could use.

And that's the reason for this enormous range in the incidence -- in the calculations for genetic effects.

Q All right.

Now you're also making a linear assumption, is that not true, that you can deal with it at -- it's much more easily measured at higher levels, and then you linearly decrease that?

A That's correct. I'm making, in all these calculations -- all these calculations are based on the conservative assumption that one can extrapolate results observed from doses, large doses given at high dose rates down to low doses at low dose rates.

And for neither the somatic effect, the cancer effects, or the genetic effects, have I taken any amelioration in the calculation for the presence of repair factors. And we know that repair is present in both the somatic and genetic effects, but these have not been so calculated.

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Q And the reason that there is such a large range in that number is, in part, because of the difficulty in making calculations based on an insufficiency of experimentation?

A Correct. These are, however, you know, the best -- these are taknn from the BEIR report, the National Academy of Science BEIR report and they are, they represent the best estimates that we can make.

And they are estimates because, as I explained, we have no -- as far as genetic effects are concerned, we have no direct quantitative data that we can extrapolate for them in man.

Q Now I notice that in part -- sliding down page nine to the third sentence under E, you've characterized a conservative assumption, as a conservative assumption, that a person would be traveling 100 feet from the truck for 175 miles.

A 170.

Q Excuse me, 170 miles.

A For four hours.

Q For four hours.

What happens to your calculation if you consider a bus filled with, say -- a school bus parked alongside the cask at a distance of perhaps three meters for several hours.

A Well that's a different condition that you're

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asking me to calculate. I could sit down and make such a calculation.

But I'm talking about here of people who are traveling concurrently, I'm not talking about here people who are stuck in delay. I deal with the question of delay a little later on.

If you were interested, I could make such a calculation if that were to be considered reasonable.

May I say this? That I have read the testimony of the CESG, and I've read a postulated --

CHAIRMAN MILLER: Just a minute now. You're getting anticipatory. Counsel may ask if he wishes. He will pose to you certain situations --

THE WITNESS: I apolg ize.

CHAIRMAN MILLER: No apology necessary. I just want to get the testimony into proper order and sequence.

BY MR. BLUM:

Q By what factor--if you decreased that 100 feet to, let's say, three meters, 10 feet or so, how does your calculation change?

A Well it would increase by an appropriate amount.

Q Well what is the appropriate factor?

A Well radiation--there's a question of the inverse square law of radiation. That's the way it would go up.

Now, can I --

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Q It would increase by 100 if you want from roughly 100 feet to 10 feet, would it not?

A Well roughly I would say that would seem a reasonable amount.

But I'd like to comment on the fact that I stated this was a conservative assumption. I don't believe it is a realistic assumption, that someone would drive 10 feet at 50 miles an hour behind a truck for four hours.

CHAIRMAN MILLER: Dr. Hamilton, let me instruct you slightly.

You're an expert witness, you're being cross-examined --

THE WITNESS: I apologize.

CHAIRMAN MILLER: You're testifying in response to questions. You're not an advocate, you're under no compulsion to defend to the death anything.

THE WITNESS: I apologize.

CHAIRMAN MILLER: It's something that I tell all expert witnesses.

THE WITNESS: I was responding to what I felt was an attack on the use of the word "conservative."

CHAIRMAN MILLER: You'll certainly have plenty of opportunity to explain, which may or may not be in defense of any assumption. But don't assume that you have to defend anything because you don't. All you have to do is answer

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questions.

THE WITNESS: I apologize for my --

CHAIRMAN MILLER: No apology is required.

Proceed.

BY MR. BLUM:

Q Isn't it normally true that you use the word "conservative" in this regard to indicate the maximum possible doses?

A No.

CHAIRMAN MILLER: I think now since you've been asked about what you mean by conservative assumption at least in that context you may explain how you use the term.

THE WITNESS: Thank you very much.

CHAIRMAN MILLER: Now you have the chance to go a little farther.

THE WITNESS: Thank you very much. I appreciate it.

I think it's very conservative to assume that one person is going to remain behind the truck which is obviously clearly going to be -- it's going to be clearly labeled, by the way, I mean, I'm aware of the conditions under which this material is transported -- and drive the whole 170 miles at 50 miles an hour behind the truck. I first of all think that's conservative.

I think it's even more conservative to assume that

the very same person is going to make exactly the same trip four times for 400 shipments, and I'm on that basis that I've calculated the dose. I don't think of anything more conservative than that.

CHAIRMAN MILLER: Well at least you regard it as relatively conservative in your judgment?

THE WITNESS: Reasonably conservative in my judgment. I do not believe it's reasonable to assume that any person who is going to drive at 50 miles an hour within 10 feet of a truck is going to remain behind the truck.

And I don't have to qualify myself as an automobile expert, I hope, but in my experience, people who tend to drive who would drive 10 feet behind the truck would pass it at the earliest possible opportunity. They certainly wouldn't remain behind it for four hours and they certainly wouldn't follow every shipment at that speed 10 feet behind the truck, for 400 shipments.

CHAIRMAN MILLER: I believe you've explained your use of the term "conservative."

BY MR. BLUM:

Q First of all, Doctor, it doesn't make any difference whether it's one person following behind the truck making 400 trips or 400 different people following the truck over, you know, one of its trips, does it? It gives you the same effect.

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A That's perfectly reasonable.

Q So we don't have to postulate the same person making the 400 trips at all to get the total person-rem.

A The total person-rem, no, that's true. But I've expressed this in rem per person. The total dose would be the same but I've made this calculation on the rem to the individual person.

Q Well aren't we really concerned with total population effects when you're talking about random incidence of cancer?

A We are. We're also concerned with the risk to the individual, too.

Q You're not any expert on whether trucks travel in convoys on the highways nowadays, are you?

A No.

Q It might not be an unreasonable assumption too, given what we read in the newspapers, to assume one truck following another at a very close distance?

MR. MC GARRY: Object, Mr. Chairman. The witness has just stated in response to the previous question he is not familiar with the convoy scheme for trucks.

CHAIRMAN MILLER: Sustained.

BY MR. BLUM:

Q Are you familiar with four-lane interstate highways?

A Well I've traveled over them, yes. As a person,

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but I'm not now speaking as an expert.

Q Wouldn't you arrive at a situation similar to the one person following the truck for four hour situation if you have the truck being passed in the parallel lane rapidly and repeatedly over the 170 miles?

A This is already -- it's a little outside my area of expertise and I'd rather say that I cannot answer that question. I would bow to those who are experts on transportation.

CHAIRMAN MILLER: Very well.

BY MR. BLUM:

Q You didn't measure any of the numbers that you used in this calculation personally, did you?

A No, I relied on the Environmental Impact Appraisal as I've so stated already, by the Staff for these particular figures on transportation, and I find they are in reasonable agreement as I've already answered with figures that are given in UNSCEAR?

Q But the particular numbers that you used to calculate doses were measured -- were given to you by Mr. Lewis?

A No, as far as transport is concerned, the tranport and handling of the fuel, the workers who are engaged in that, I relied on Mr. Lewis' figures, as I've explained already in the present way and I relied on the actual doses to the public

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on the Environmental Impact Appraisal as well as Mr. Lewis.

But the figures I primarily used were those of the EIA, so far as the transportation doses to the public are concerned in these various conditions of tranportation.

Q And you relied upon Dr. Garrick as another check of the transportation, the risk analysis?

A I relied partly upon Dr. Garrick, I relied on the Environmental Impact Appraisal and, as I've already stated, I relied on my own assessment that I made in connection with the environmental impacts of the tranportation of nuclear fuel as of June of last year. I had reviewed the literature up to that time and I relied on -- in calculating the risks of transportation and of accidents, I relied on WASH-1238, on a paper by Cohen and Dance, "Scoping Assessment of the Environmental Health Risks Associated for Accidents in the LWR Supporting Fuel Cycle," Technitronic, Washington, D.C., 1975 -- this was prepared for the Environmental Protection Agency -- and on Nuclear and Systems Science Group of Homes and Harvey, Inc., "Transportation Accident Risks in the Nuclear Power Industry, 1975 to 2020," prepared for the U.S. EPA Office of Radiation Programs, November, 1974.

Q All right.

If it should turn out that the Environmental Impact Appraisal estimates of release during an accident were low by 1,000 times, would your genetic risks and somatic

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1 risks increase by 1,000 times?

2 A They would, indeed, but can I explain that that

3 would not make any difference to my calculation.

4 I've calculated from the EIA, for example, from

5 the worst possible accident that the chance of getting

6 cancer, the probability of getting cancer from an accident

7 for the 300 shipments--taking into account the frequency of

8 the accident, of course--is less than 100 millirem, less

9 than one in 100 millirem.

10 If I were to consider that the people were actually

11 exposed to this accident and actually got the doses, if there

12 was such an accident, if I assume this and calculate the

13 chance of developing cancer from this accident using the doses

14 provided here--that is, we make the assumption the accident's

15 already happened and people have received these doses, I

16 find that the chance of developing cancer from natural back-

17 ground during this same period from these doses is 200 times

18 greater, 200 times greater.

19 So that on that basis 1000 times is certainly --

20 as far as when you take into account the probability,

21 wouldn't change my conclusion.

22 Q Well let's look at Table 6-2 on page 36 of the

23 Environmental Impact Appraisal.

24 A Yes, sir.

25 Q I believe you said you relied on this.

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A No, I relied on Table 6-3. That is the First-Year Doses and 50-year Dose Commitments for the Postulated Extra Severe Transportation Accident.

Q All right. Let's look at that one.

A That is the one that has the probability of occurring 4.3×10^{-8}.

MR. BLUM: I move to strike that. No one has testified to that. That's the probability he relied on.

CHAIRMAN MILLER: That's what he testified to.

MR. BLUM: I have no objection that he relied on it, but he just stated it as a fact, that that's the probability.

CHAIRMAN MILLER: Well I don't think the Board so understands. We understand that that's the figure -- that's the data contained in the Staff's Environmental Impact Appraisal, and we have not, take it as the present state of the record that he's going beyond it in the use made of it by Dr. Hamilton.

BY MR. BLUM:

Q Supposing you look at footnote A:

"Maximum individual is defined as a person located 100 meters downwind from the accident."

What I want to know is if, in fact, the maximum individual is a firefighter, pulling the driver out of the cab,

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wbl 1 and is therefore, perhaps, one meter or two meters from the
2 accident, excluding the driver, of course, how does the cancer
3 rate go up?
4 A I'd like to explain that there may well be a
5 single individual who's involved in coping with the accident
6 who does, in fact, in his occupational exposure receive a
7 higher dose. I mean that could well be. I assume that people
8 who fight these accidents.... I'm really not an expert in
9 how you would cope with this, but I assume they would be bound
10 by certain limits of exposure. But, in any case, the contri-
11 bution to that single individual, that dose to that single
12 individual would be, even if you take that into account, would
13 be relatively small compared to the dose that one calculates the
14 11 to 200 students would receive. You see, they provide the
15 bulk of the person-rem dose, I would think, in such an esti-
16 mate.
17 And so bearing-- What they're talking about here
18 is an analysis for the -- and it seems to me to be a reasonable
19 analysis -- of how you would calculate the hazard to the
20 public. And the occupational dose I think would be a small
21 contribution to this.
22 Q Does it seem reasonable to you that any fire depart-
23 ment is going to be fighting the fire which is included in
24 this severe transportation accident, from 100 meters?
25 A No, I didn't say that. That would be unreasonable

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wb2

1 to assume that. I assumed the firefighters would be near it.

2 Q But this Category A is supposed to refer to the

3 maximum individual.

4 A Well I tried to explain how I think this has been

5 calculated. And I think it's a reasonable assumption that

6 we're dealing here with the effects on the general population.

7 Q If we could look back at-- Did you use Table 6.2

8 in any way?

9 A No, I didn't use Table-- I mean, I looked at

10 Table 6.2, but I haven't used it to make any calculations.

11 I decided to concentrate on the extra serious accident.

12 I should point out to you that-- Well, I'm sorry.

13 Q The basis for your statement that multiplying the

14 radiation by tenfold makes no difference is the frequency

15 of accident calculation made by others; is that correct?

16 A That's one of the-- Yes, that's a very important

17 consideration.

18 Q If I calculate that this accident -- that you will

19 only get an accident one in a million times or one in ten

20 million times, then it doesn't particularly make any difference

21 what radiation is released in that accident?

22 A No, that's not what I say. Certainly not what--

23 That is not what I say.

24 Q Well, as I understand it, you're saying -- and let

25 me try this again: because the accident probability is so rare,

so little, the expected consequences in genetic and somatic effects are small; isn't that fair?

A That's correct.

Can I remind you--

Q You may explain.

A Well, I explained that I made the assumption that the accident described in Table 6-6 actually happened. I say, Forget about the low probability: let's assume it happened, let's assume that these people get these doses. All right. That's what I did.

Then I calculated-- In other words, taking no account of probability. I calculated what dose these people would have received. You see, we're talking about a dose commitment for the first-year dose and the 50-year dose commitment, and that's how this is calculated. I calculated the dose these people would have received from natural background radiation during this period. And I calculated that, even if this accident had happened, these people, using the same damage function that I used for all the radiation from the accident, the exactly same damage function, would have received -- would have had a 200 times greater chance of developing cancer from natural background radiation than they would have had from being exposed -- having been definitely exposed to this accident.

Q All right. But to do that you took the maximum

wb4

1 individual dose as given on Table 6-3?

2 A That's correct; I took the figures here of

3 3.7×10^2.

4 Q In that case--

5 A 370 man-rem.

6 And if you multiplied that by 10, which I was asked

7 to do, by the way, 370, natural background would still give

8 people a twenty times greater probability of developing cancer,

9 even if the dose were ten times higher.

10 So, in other words, if they had been exposed to

11 ten of these accidents, the same people, during that period,

12 they would still have had a twenty times greater chance of

13 developing cancer from natural background during the same

14 period.

15 Q That 370 figure is the total body dose commitment

16 in man-rems at Population Center C?

17 A That's correct; the largest group.

18 Q And, of course, the assumption is that that

19 population is 400 meters and remains, on an average I suppose,

20 400 meters from the roadway; is that right?

21 A Correct.

22 Q Did you, for example-- I notice there's a bone

23 dose which is substantially higher, but that. Does that

24 relate to leukemia effects?

25 A Well that might refer to bone tumors or leukemia.

POOR ORIGINAL

Q Did you work with that figure at all?

A Yes, I did.

Q And how does that compare to the natural background radiation?

A Well these figures-- As you've asked me, I'll give you the figures so that the Board can have some appreciation.

The whole body dose gives you an incidence of cancer -- this is assuming the accident happened -- of 9.9×10^{-1} to 1.5×10^{-1}. That's the incidence. This is assuming it happened. And the mortality from that is, assuming it has happened, would be 2.6×10^{-2} to 4.3×10^{-2}.

Now the bone cancers would be: incidence, 3.9×10^{-5}. And eventually the bone cancer deaths would be $.5 \times 10^{-5}$.

So, you see, those risk estimates, even though one is dealing with, apparently, what appears to be a higher dose commitment, would result in substantially lower numbers of tumors.

Q When you say 9.9×10^{-1} --

A I said 9.9×10^{-2}. I'm sorry; it's difficult to keep up with these exponentials.

Q That is-- Is that 100?

A That's 0.0.... It's not 100, no.

Q It's 1 in 100?

A It is 0.099, the lower limit.

POOR ORIGINAL

wb6

Q I'm sorry, that's 1 in 10, essentially 1 in 10; is that correct?

A One-tenth of a person out of the 1100 and 200 would get a tumor.

Q But yif you make some assumption that some of those students might -- or a goodly percentage, perhaps, might come and observe a massive transportation accident taking place close to their campus, those figures could go up substantially?

A Is this a hypothetical question that I should answer?

CHAIRMAN MILLER: It's a hypothetical.

THE WITNESS: Well if, for some reason, they were able to get closer to the accident, the answer is yes. If they got closer they would expose themselves to a greater dose and the figures could increase substantially, if they really got really close, yes.

BY MR. BLUM:

Q For instance, the thyroid line, does that assume any ingestion of -- if you know -- of radionuclides, radioactive iodine?

A The thyroid dose? Is the question, Does the thyroid dose here in Table 6-3 assume any dose to the thyroid from radioactive iodine; is that the question?

Q Yes, sir.

A Yes, I assume that it does.

wr7 1 Q And similarly, do you know whether the bone dose
2 assumes any ingestion of strontium-90?
3 A I assume the deposition of internal emitters,
4 such as strontium-90 attacking the bone.
2.118 5 Q Does that not give you a different effect from
6 the body absorption of gamma emission, then?
7 A No.
8 May I explain?
9 Q You may explain.
10 CHAIRMAN MILLER: You may explain.
11 THE WITNESS: For the purpose of estimating risk
12 one calculates the whole body dose or external dose from the
13 various sources of radiation in the atmosphere -- they may be
14 on the ground or in the atmosphere, and so on. In the accident
15 situation you do get a certain number of the materials that
16 are in addition to irradiating the people from the outside,
17 as it were, external whole body radiation, which are actually
18 ingested or inhaled. They go through complicated pathways,
19 either through air or food or anything else, and they then
20 give you doses to the thyroid, bone and lung, depending on the
21 type of isotope and the type that is deposited in the parti-
22 cular material.
23 These are discrete doses that are in addition to
24 the whole body doses in this situation.
25 But usually-- As a matter of fact, as you can see,

wb8

1 the whole body dose, as far as producing damage is concerned
2 in this particular situation, the effects far outweigh the
3 numbers that you calculate for either bone cancer or lung
4 cancer or thyroid cancer, very considerably greater, by sever-
5 al orders of magnitude.
6 I can give you all those figures. I've calculated
7 them all. I've calculated them all for this and many other
8 situations.
9 MR. BLUM: If I may have a minute, please.
10 CHAIRMAN MILLER: Yes.
11 (Pause)
12 BY MR. BLUM:
13 Q If you will look at page 11. What's the assumption
14 made by that caption? Are you assuming that there are circum-
15 stances in which NRC regulations are not complied with?
16 A I'm sorry; which caption are we talking about?
17 Q g.
18 A Oh, "Residual health risks."
19 CHAIRMAN MILLER: Will you read the caption aloud,
20 please, Dr. Hamilton?
21 THE WITNESS: Yes. "Residual health risks to
22 workers even if NRC regulations are complied with."
23 No. No; of course not. I assumed that they were
24 going to be complied with. And, in fact, from my-- I'm sure
25 they're going to be complied with. But I gathered it was one

1 of the-- If you will look, I was asked to -- the Power
2 Company had asked me to assess the various health effects
3 with their proposed activity of transporting spent fuel.
4 And one of the contentions I understand was if the residual
5 health risk to workers would be serious even if NRC regula-
6 tions are complied with. And that is what this assessment
7 is about. So I'm really being responsive to that contention,
that the occupational exposure would pose a special hazard
9 even if the NRC regulations were complied with.
10 CHAIRMAN MILLER: And assuming that they would be
11 complied with; is that correct?
12 THE WITNESS: Yes, of course. Yes.
13 DR. LUEBKE: A question for clarification:
14 Are these exposures higher than the other
15 exposures you've been talking about previously?
16 THE WITNESS: No, they're identical.
17 DR. LUEBKE: I see. Identical.
18 THE WITNESS: These, of course, are the occupa-
19 tional... I focussed in on the occupational exposures
20 because I understood, if my memory serves me correctly, that
21 it was an NRDC contention that even if the NRC regulations
22 were complied with there would be some health hazard,
23 occupational health hazard. And I've calculated what these
24 were, specifically addressing myself to the occupational part
25 of them at this point.

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wb10

I hope that clarifies that point.

CHAIRMAN MILLER: Thank you.

MR. BLUM: Thank you.

That's all we have.

End WRBloom
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MR. KETCHEN: Mr. Chairman, I have several questions.

CHAIRMAN MILLER: Let's see if the State -- is it State or Commonwealth, Mr. Wilson?

MR. WILSON: State, Mr. Chairman.

CHAIRMAN MILLER: Does the State of South Carolina have some questions?

MR. WILSON: We have no questions, Mr. Chairman.

CHAIRMAN MILLER: All right. Staff.

MR. KETCHEN: Thank you, Mr. Chairman.

BY MR. KETCHEN:

Q Dr. Hamilton, I would just like to ask you a few questions for perspective here, and would ask you to answer the questions remembering that I am a layman, if you will.

You mentioned some figures for background radiation in North Carolina. Is there one figure for background radiation, or is there a range of figures?

A Well, there are a range of figures. I believe on Saturday I testified that the variation in the United States goes all the way from 30 millirem a year to 240 millirem a year. And the figure I quoted for South Carolina is taken from an EPA 1977 document. The average is 135 millirem, and North Carolina is 145.

And, of course -- well, I think I -- does that answer your question?

Q Yes, sir. Is there a range on the North Carolina

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figure?

A I assume there is a range, but I don't have it immediately at hand. I have an average figure of 145.

Q And you didn't calculate or seek out a range for the South Carolina figure?

A No. 135 -- no, as a matter of fact, the figure I used for my calculation, I took the average between the two for the transport thing. That's a very rough approximation of 140 millirem per year. And it's that figure I used for my 200 times figure.

As a matter of fact, I used that figure to calculate the chances from natural background radiation, from routine releases from the shipments, would be 60,000 times greater than the doses that people would get from the routine shipment of 300 fuel assemblies. In one year, those 41,000 people would receive, living within half a mile of the route, would receive 60,000 times more radiation from natural background than they would get from the shipments of the spent fuel assemblies.

May I ask if I am being clear?

Q Yes, sir.

A Thank you.

Q Now, I would like for you to, if you would, characterize that figure of 60,000 times, if you will, in your expertise, as to your thinking of my thinking of large,

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small, big.

A Well, it's very minute.

If I can explain, I have been at the hearings since, I believe, Thursday, and as a physician and as one who is engaged in assessing the health and environmental impacts of different energy sources with the motive of trying to make these risks and hazards objectively available to decision makers -- and I mean by decision makers, the American public and their elected representatives, as well as specialized boards such as this -- I am very disturbed by the misperception of the size of the risk involved in this activity, and I would like very much to try to explain and convince people from my objective analysis what the actual risks are.

The simplest thing is this:

One percent of the population die every year. We have 200,000,000 Americans. So, 2,000,000 Americans die every year. There's a one percent possibility of dying.

Let's take the commonest form of sudden death, automobile accidents. There are 50,000 automobile accidents per year in the United States -- 50,000. That means that of the 2,000,000 who die, there's 1 in 40 of those deaths that are in automobile accidents.

That means that if we have a one percent chance of dying, each of us has a 1 in 4,000 chance each year of being killed in an automobile accident. That's a simple and

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easily understood, I think, naturally. And I think it explains to some extent why people are concerned in their minds with anything to do with transportation, because I think sub-consciously we are aware that there are accidents involved in transportation.

Now, I have calculated from the ETA Staff report that there's less than 1 in 100 million chance of this population dying -- or, rather, not even dying. 1 in 100 million chance of them getting cancer as a result of the accidents reported in this ETA -- 1 in 100 million. And there's less than 2 in 1 billion chance of them dying from that cancer.

Now, my problem is I perceive these figures; how can I transfer this perception-- I mean that is my problem -- to the decision makers? That's something I'm thinking about.

Q Dr. Hamilton, as a followup to that, do you have a definition in your own mind as the expert here that you can give us of the meaning of significant or, conversely, insignificant?

A Well, I try not to use the term significant or insignificant.

CHAIRMAN MILLER: I might ask, Doctor, do you use those terms in your testimony?

THE WITNESS: No, I do not.

405 041

CHAIRMAN MILLER: Then you're not purporting to

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have any expertise in that regard in this connection, are you?

THE WITNESS: Well, I think "significant," the use of the word "significant," this is a philological problem, and I'm not a philologist. I'm a health expert. And I have to deal with the question of significance in the statistical sense of the term.

But as I understand the question from counsel, he's asking me to comment on some statements that people make that all radiation is significant, no matter how small. And they're using the term significant here, because they say that all radiation can produce harm in man.

I believe that statement is in some of the material I have seen in connection with this case.

So much for that.

MR. KETCHEN: Actually I was trying to get, Mr. Chairman, a -- the goal of the question is to get a quantitative definition of these numbers; not in grammatical terms but in a quantitative sense.

But if "significant" is maybe an ambiguous term, maybe I would use another term, I'll withdraw the term "significant" and use another term.

405 042

BY MR. KETCHEN:

Q I think you used the term "minutes" in response to my question on what these figures, 1 in so many million, or

2 in so many billion mean.

You are allowed, I believe, as an expert to give your judgment as to the nature of those figures, and I would like your judgment on that.

MR. BLUM: Objection.

CHAIRMAN MILLER: What basis?

MR. BLUM: I object to the form of the question, in the first place. I'm not sure what he's being asked to do, and I'm not sure that it hasn't already been fully discussed as well, as far as what he feels these things are.

CHAIRMAN MILLER: Well, now that's kind of an inconsistent objection. First you don't understand the question and, secondly, it's already been answered.

MR. BLUM: We've been all over the area, for one thing. But I'm not sure that anyone can answer the question as it was asked.

CHAIRMAN MILLER: Well, we'll find out about that.

Dr. Hamilton, does the question have any meaning to you, within an appropriate frame of reference, or is it something that's getting speculative?

THE WITNESS: No, I think it has some meaning.

CHAIRMAN MILLER: What is the meaning that you derive?

405 043

THE WITNESS: The meaning I derive is that counsel

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is seeking, as a lay person, to understand: Am I concerned as a physician with the size or the lack of size of these health effects, and he's trying to -- I mean I think the difficulty with the word "significant" is that it has some sort of judgmental value attached to it.

CHAIRMAN MILLER: I think you're correct in that.

THE WITNESS: Yes. That's why I've avoided it.

I should explain -- I'd like to explain, sir, that in my testimony, as an Englishman, I try to avoid the use of the word "very," so that when I've used the word "very" small in relationship to these overall health effects, that's what I mean. It represents an English understatement, as a matter of fact. They are, you know, minute or miniscule. They're extremely tiny, the health effects that we're discussing here.

As a matter of fact, if you're going to take a strict mathematical point of view, I put some of these into various programs that people consider to be reasonable in calculating health effects, and they come out with -- you know, they don't give these more or less minus numbers, they come out with zero. That doesn't mean to say they are zero. I believe we calculate them just for the very purpose that, as Mr. Blum is trying to show, that if for some reason or other these things are out by a factor of 1,000 when you multiply these by 1,000 what do you get? I think that's a

very genuine concern.

But I think I would emphasize that these are upper-limit estimates, and they're very, very tiny. The numbers could be zero.

I feel, myself, that people who go around saying that radiation, no matter how small, is significant, are not living in the real world. Because everybody knows if you travel in an aircraft you get an additional millirem from the east to the west coast. If you go so many feet high, you get more radiation. If you were to go and live in Denver, Colorado you'd get very much more radiation. If you were to go through Grand Central Station, which is built of granitic stone from Millstone Point, if you commuted through there five days a week and spent only 15 minutes a day, you would accumulate in a year, I worked out, 5 millirem a year.

Now, 5 millirem a year is a substantial figure compared to the figure we're talking about here. We're talking about a figure to the population from these 300 shipments of 0.02 millirem per year. And here you go to Grand Central Station, and you get 5 millirem per year.

I might mention a chest X-ray, 10 millirem a year.

If you have a G.I. series, you'd get 1,000, or 10,000 millirem.

Another thing I find objectionable in all this that people automatically talk about is that any dose of

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radiation is hazardous. Because, clearly, there are some circumstances when, as a physician, a dose of radiation, even though it's very much greater than the dose we're talking about here, can in actual fact contribute substantially to the benefit of an individual receiving it. I am referring to diagnostic radiology and radiotherapy, and the other healthful uses of radiation in the practice of medicine. I would hate to see a situation in which we're deprived of this, because people have some extraordinary idea that any dose of radiation is hazardous and is significant.

BY MR. KETCHEN:

Q Dr. Hamilton, you gave a number earlier today with respect to cancer incidence that you evaluated from the EIA of 4.2×10^{-9} effects.

As a physician advising this Board or me, as a layman, does that figure fit into your definition of very small, as you describe it?

A I can't think of anything -- you know, anything that's 10^{-9} is a billion -- one in a billion. I mean that's a very, very tiny, tiny figure.

I think my figures speak for themselves, and I wish people would look at them and take them into account.

Q The same way with 6.3×10^{-9}?

A Correct.

Q And the same with respect to the figures 7.2 to

10.8×10^{-8}?

A Correct. Those are all extremely tiny figures. I mean for all practical purposes, they're zero.

MR. KETCHEN: Thank you, Dr. Hamilton.

MR. BLUM: May I have some recross, or do we go back to Mr. McCarry?

CHAIRMAN MILLER: Yes, Mr. Blum.

BY MR. BLUM:

Q The major factor in those very small numbers, 10^{-9}, 10^{-8}, is the probability of the accident?

A Correct.

Q So, you're basing those figures, at any rate, on the calculations of others with regard to the probability of the accident?

A Correct.

Q Are you familiar, for instance, with the concept of the 100-year flood, or is that outside your area of expertise?

A I'm not.

Q And it's your position that, as a physician, would it not be your advice to the general person that they should minimize radiation exposure?

A Minimize it within reasonable limits, yes.

Q That is the reason that general population-wide chest X-rays have been, by and large, eliminated?

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1 A Yes.

2 I'd like to explain that, as I testified on

3 Saturday, and as I repeated today, I would be concerned with

4 any practice that exposed large number of the American

5 population to doses that approach natural background, and

6 one of the things that we found in the 1960s was that the

7 genetically-significant dose from the medical use of

8 radiation was approaching natural background.

9 As a matter of fact, in 1957 the figure was 97

10 millirem a year.

11 As a result of this, the Public Health Service

12 and the American medical profession made a determined effort

13 to reduce unnecessary radiation exposure.

14 These are very high doses compared to the doses

15 that we're talking about in this transportation.

16 CHAIRMAN MILLER: What doses were you considering?

17 You mentioned 97 millirem a year. Was it within that range?

18 The doses that you said might start to cause you concern?

19 THE WITNESS: Well, that did cause me concern,

20 because, you see, that's almost equivalent -- natural

21 background is 80 millirem to 240, and I think if there were

22 any practice in this country that began to give the

23 population doses of 80 millirem per year -- that's what I

24 said, as a whole -- I'd begin to be very concerned about it

25 and would start trying to reduce it.

As a matter of fact, it is my understanding that the Nuclear Regulatory Commission has regulated the nuclear power industry to the extent that it reduces the exposure of the population at any point in the fuel cycle to the general public to less -- to 5 millirem or less per year. That's the so-called post-boundary limit to the amount of radioactivity that a reactor can give off.

The reactor, of course, as a matter of fact, is the major contribution at the moment in the American fuel cycle to the whole nuclear fuel cycle. Correspondingly, the doses from any other portion of the nuclear fuel cycle to the population are going to be substantially less.

That is why I believe a dose that's been calculated here to the population within a half mile of a transport activity would receive 0.02 millirem a year. That seems to me to be a reasonably low dose.

CHAIRMAN MILLER: Thank you.

BY MR. BLUM:

Q Now, as I understand what you've said now in response to Mr. Ketchen's questions, you're here testifying as an advocate of your belief that there are minimal risks from this activity.

A No, I'm not an advocate. I'm testifying on the results of what I believe is an objective, scholarly analysis. This is how I perceive the risk as a result of my objective,

POOR ORIGINAL

1 scholarly analysis.

2 I mentioned that the problem that I face here, that

3 I'm aware of, is that there seems to be a difference between

4 this objective, scholarly analysis which takes all the best

5 information we possibly can and builds it into a unified

6 analysis of the situation, and the perception of this by

7 other people.

8 So far as I'm advocating anything, I wondered how

9 I can transfer my perception -- I'm not advocating it -- my

10 objective perception to other people.

11 Q Your perception is that there are minimal risks

12 from this transportation activity?

13 A Very small, yes.

14 Q And you're trying your best to convince others

15 of that?

16 CHAIRMAN MILLER: I'll sustain an objection to

17 that. You needn't answer.

18 MR. BLUM: No further questions.

19 CHAIRMAN MILLER: Is there redirect?

20 MR. MC GARRY: Yes, Mr. Chairman, I have several

21 questions.

22

23

24

25

sbl

REDIRECT EXAMINATION

BY MR. MC GARRY:

Q On page 12 of your testimony, Dr. Hamilton, the second to the bottom line, the figure 7×10^{-4}, should that "x" be deleted?

A No, no, that's correct.

Q 7×10^{-4} x?

A No, no, you're right. There should be a dash. That's a typographical error, yes. I'm sorry. You're absolutely right, Mr. McGarry. I apologize. That is a typo that I overlooked.

CHAIRMAN MILLER: You're showing a range there, are you not?

THE WITNESS: That's right, I'm showing a range and there should be a dash there instead of a times. I apologize.

DR. LUEBKE: What line are we on?

MR. MC GARRY: Second to the bottom line on page 12.

CHAIRMAN MILLER: Penultimate line, Dr. Hamilton?

THE WITNESS: Yes, the penultimate line, to use a philological effort.

CHAIRMAN MILLER: I thought you might like to use it. Some of us use it quite promiscuously.

BY MR. MC GARRY:

405 051

Q Reference is made to the BEIR report. Is the

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WEL/eb2

BEIR report a recognized data source by an individual such as yourself who deals daily in health effects?

A It is.

Q Is it the most accepted document in this area?

A In the United States it is.

Q You made reference to a 1974 document which was prepared in EPA.

A Correct.

Q I believe you gave us the authors for the 1975 document who were Cohen and Danc. Who were the authors of the 1974 EPA document?

A The 1974 authors-- This is the paper, "Transportation Accident Risks in the Nuclear Power Industry, 1975 to 2020." The authors were C. V. Hodge and A. A. Jarrett. And by coincidence -- I only discovered this this morning --this was done for the Environmental Protection Agency, and the project director was Dr. B. J. Garrick.

Q Dr. Hamilton, you used the figure 42,000 people in your calculations. Is that correct?

A That is correct.

Q If that number were to increase or decrease by 10 or 20 thousand, would that materially affect your testimony?

A No, because the dose is very tiny. It's a very tiny addition.

405 052

Q On Table 6-3 of the Staff's Environmental Impact

Appraisal which appears on page 30 of that document. Do you have that before you, Dr. Hamilton?

A I do, yes.

Q Looking in the far right-hand columns underneath Population Center B, those are the columns that you made reference to in your testimony today? Is that correct?

A Yes, those are the columns, the last column, the dose commitment man-rem. Those are the columns that I used to calculate the total cancers resulting from whole-body, thyroid, bone and lung doses.

Q Now you've given us your total body dose. Is that correct?

A Well, the result of the total body dose is given here. I gave the results of the total body estimates.

Q And you also gave the results of the bone?

A I did.

Q Did you perform similar calculations for the thyroid and the lung?

A I did.

Q Can you provide those?

A Yes.

For the thyroid, the incidence is 2.9×10^{-4}. That's the incidence.

405 .053

And the mortality is 1.5×10^{-5}. This is assuming the accident actually happens.

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WEL/eb4

And the lung figures, the incidence is 3.9×10^{-5}.

And mortality from lung is 3.5×10^{-5}. This is assuming that this accident actually happens. This would be the consequences.

Q Dr. Hamilton, taking all these results into consideration, and by that I mean the total body, the thyroid, the bone, the lung, is the resulting incidence consistent with your testimony in this proceeding?

A Yes.

MR. MC GARRY: I have no further questions, Mr. Chairman.

CHAIRMAN MILLER: Any cross based upon the redirect?

MR. BLUM: No, sir.

MR. KETCHEN: No questions.

MR. MC GARRY: Mr. Chairman, at this time I would move--

CHIARMAN MILLER: Oh, pardon me. I'm sorry. We do have a question from the Board.

Dr. Luebke.

EXAMINATION BY THE BOARD

BY DR. LUEBKE:

Q It may not be so much a question as a clarification.

I've been working on your paragraph G. Near the end it has to do with workers' exposure.

405 054

WNL/ebf

A Yes.

Q Your testimony is in the cross style with an abundance of exponential numbers in it, so it's a little heavy reading, you might say.

A I apologize, but I wanted to be as succinct as possible, you know, give you the figures and facts.

Q Is my general impression correct from these exponential numbers that the workers, even at small levels, get more exposure than the population or individuals in the population?

A That is correct.

Q So then for my own amusement and information I took your paragraph G and made a tabulation of it and I just wanted to see if that was fair and if I did it properly, and I wanted to rank the options in the order from less effect to more effect, even though the numbers were small.

And on the first one I have AFR onsite, and the person-rem is 49, and the cancer incidence is 1.3 to 1.9 x 10^{-2}, and the mortality is 0.3 to 0.6 x 10^{-2}.

Now I won't go through the entire tabulation--Oh, first of all a question.

AFR is annual fuel requirements still?

MR. MC GARRY: No, that is now, in this proceeding, referred to as away from reactor.

405 055

THE WITNESS: I apologize but that is--

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DR. LUEBKE: Away from reactor onsite? You mean 100 feet away from the reactor?

MR. MC GARRY: It's an independent spent fuel storage facility onsite. There's one onsite. And another scenario is that same facility offsite.

DR. LUEBKE: Okay. Away from reactor.

CHAIRMAN MILLER: The first paragraph onpage 12 then, AFR onsite, 49 person-rem, that refers to the away-from-reactor located onsite?

MR. MC GARRY: That's correct, Mr. Chairman.

BY MR. LUEBKE:

Q Well, then the second item in this table was transfer and storage of 400 fuel assemblies at McGuire.

And the third item, AFR offsite.

And the fourth was -- I put them in order -- reracking with stainless steel.

And the fifth one was reracking with poison racks. That was 107 person-rem.

You were asking about the perception of readers. Someplace here in proposed findings or whenever there's an opportunity, maybe some tabular approach might help the reader.

A Yes. For my own usefulness, I have such a thing.

CHAIRMAN MILLER: Yes. And then you wrote the prose.

wel/eb7

(Laughter.)

You have such a table in your own hand, prepared for your own use, Dr. Hamilton?

THE WITNESS: Yes, I have such a table.

CHAIRMAN MILLER: Would there be any utility to read that into the record?

THE WITNESS: Would you like to have it? Shall I read it? I mean could I not provide it? This is my own record.

CHAIRMAN MILLER: If you have no objection. I'm [illegible] have something that [illegible]

THE WITNESS: No, no, no.

CHAIRMAN MILLER: Fine.

What would be the easiest method, Dr. Hamilton, to read it into the record, have your own handwritten notes xerozed, or to have it typed? We don't really--

MR. MC GARRY: Mr. Chairman, it would probably be just as easy to read it into the record at this point.

CHAIRMAN MILLER: All right.

THE WITNESS: That will take a little time. All right.

The options: Option 1 is modification of existing racks, and the total dose in person-rem calculated for 400 spent fuel assemblies. Now I'm going to give the incidence

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of cancer first, and then the mortality.

So for modification of existing racks the total dose is 84 person-rem. The incidence of cancer is 2.2 to 3.4 times 10^{-2}. The mortality from cancer is 0.6 to 1.1 x 10^{-2}.

The second option, poison racks, total dose in person-rem is 107 person-rem. The incidence of cancer is 2.8 to 4.2 x 10^{-2}, with mortality 0.8 to 1.4 x 10^{-2}.

The third option is away-from-reactor storage onsite, 49 person-rem. The incidence of cancer is 1.3 to 1.9 x 10^{-2}, with mortality 0.3 to 0.6 x 10^{-2}.

The fourth option, away-from-reactor storage offsite, total dose 72 person-rem. The incidence of cancer is 1.9 to 2.9 x 10^{-2}, with mortality 0.5 to 0.9 x 10^{-2}.

The final option, transportation and storage at McGuire, gives a total person dose of 65 person-rem. The incidence of cancer is 1.7 to 2.7 x 10^{-2}, with mortality 0.4 to 0.8 x 10^{-2}.

Now I'm going to do the same thing for the genetic effects, but in the genetic effects I will refer just to options one, two, three, four and five, and I'll take the total person-rem as given because they are the same as in the previous five where I've described the incidence of cancer.

So for genetic effects -- and here the genetic

effects in the first generation are 0.0006 to 0.009, and the genetic effects at equilibrium are 0.003 to 0.08.

In the second option, poison racks, the genetic effects in first generation are 0.0007 to 0.013. The genetic effects at equilibrium are 0.004 to 0.09.

The third option, AFR onsite, genetic effects at first generation are 0.0003 to 0.005. The genetic effects at equilibrium are 0.002 to 0.05.

The fourth option, AFR offsite, the genetic effects in the first generation are 0.0005 to 0.009. The mortality figure -- I'm sorry, the genetic effects at equilibrium are 0.003 to 0.07.

The genetic effects, first generation, for the final option, the transportation and storage at McGuire are 0.0004 to 0.008, and the genetic effects at equilibrium are 0.002 to 0.006.

And that completes the tabulation.

DR. LUEBKE: I would like to comment that it will still come out looking as prose in the transcript and will not provide the perception to the reader that a tabulation would. But I won't belabor the point.

MR. MC CARRY: We will accomodate the proposed findings in that regard, Dr. Luebke.

THE WITNESS: I would be willing to provide a table for the hearing.

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CHAIRMAN MILLER: Counsel will, I'm sure.

I take it there is nothing further of Dr. Hamilton.

MR. MC GARRY: No, Mr. Chairman.

CHAIRMAN MILLER: You may be excused, Dr. Hamilton. Thank you very much.

(The witness excused.)

MR. MC GARRY: Excuse me, Mr. Chairman, I did at this point in time request that Dr. Hamilton's testimony, which is marked as Applicant's Exhibit number 11 for identification, be received into evidence.

CHAIRMAN MILLER: Exhibit 12?

MR. MC GARRY: 12, yes, Mr. Chairman.

CHAIRMAN MILLER: Any objection?

MR. BLUM: My only objections pertain to the fact that Dr. Garrick's testimony is not yet accepted, nor is Mr. Lewis's testimony. And he has testified that in part his testimony is based on their numbers and their findings. And that is also true of so much of the EIA, as will be tested in the Staff's witnesses.

CHAIRMAN MILLER: The exhibit will be admitted, subject to connection up by counsel respectively.

(Whereupon, the document previously marked as Applicant Exhibit 12 was received in evidence.)

WEL/mpb4

MR. MC GARRY: Thank you, Mr. Chairman.

CHAIRMAN MILLER: Shall we take a recess?

(Recess.)

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CHAIRMAN MILLER: All right. The hearing will resume, please.

Who is your next witness?

MR. HOEFLING: Mr. Chairman, we've had some discussions among counsel, and it was agreed that the Staff would go forward with its witnesses in the area of CESG Contention number 2.

CHAIRMAN MILLER: 2? Which is what?

MR. HOEFLING: CESG Contention related to impacts of transportation of the cask, routine impacts, delays in transit and accidents.

Before I place the Staff witnesses on the stand in that area, I would like to call Carl Sawyer to the stand to respond to Board suggestions made last Tuesday relative to sabotage.

The Board requested that the Staff at an appropriate time present for the record and for the benefit of the public the background of and substance of the Commission's interim regulations in the sabotage area.

CHAIRMAN MILLER: Correct.

MR. HOEFLING: And also Dr. Luebke expressed an interest in getting some information related to explosions that might be associated with sabotage attempts. And Mr. Sawyer would also modify the Staff's EIA in this area since that document issued some time ago and is in need of an

mpb2

update.

So at this time the Staff would call Carl Sawyer to the stand.

CHAIRMAN MILLER: All right.

Mr. Sawyer, raise your right hand and take the oath, sir.

Whereupon,

CARL B. SAWYER

was called to the stand as a witness on behalf of the Regulatory Commission Staff, and, having been first duly sworn, was examined and testified as follows:

CHAIRMAN MILLER: Is there any prefiled testimony?

MR. HOEFLING: No, Mr. Chairman. I'm going to present Mr. Sawyer's qualifications and he will respond.

DIRECT EXAMINATION

BY MR. HOEFLING:

Q Mr. Sawyer, will you state your name and occupation for the record, please?

A Carl B. Sawyer. I am an employee of the Nuclear Regulatory Commission.

Q And in what status are you employed by the Nuclear Regulatory Commission?

A In the Division of Safeguards as a physical protection analyst.

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Q Mr. Sawyer, I place before you a document entitled

mpb3 Professional Qualifications, Carl B. Sawyer, Regulatory Improvements Branch, Division of Safeguards, consisting of two pages.

Did you prepare that document?

(Handing document to the witness.)

A Yes.

Q Is it true and correct?

A Yes.

MR. HOEFLING: Mr. Chairman, at this point the Staff would move that Mr. Sawyer's professional qualifications be admitted into evidence.

CHAIRMAN MILLER: Well, let's mark them, first of all, for identification.

MR. HOEFLING: This would be Staff number 2.

CHAIRMAN MILLER: All right.

We'll mark the qualifications of Mr. Sawyer as Staff Exhibit 2 for identification.

(Whereupon, the document referred to was marked as NRC Staff Exhibit No. 2 for identification.)

MR. HOEFLING: At this time the Staff would move Staff Exhibit number 2.

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CHAIRMAN MILLER: Well, are you going to give the Board a copy?

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MR. HOEFLING: I'm sorry, Mr. Chairman.

(Handing document to the Board.)

MR. HOEFLING: These documents have been served on all the parties.

CHAIRMAN MILLER: Fine.

Are there any objections to Staff Exhibit 2, the qualifications of Mr. Carl B. Sawyer?

MR. MC GARRY: No objection, Mr. Chairman.

MR. BLUM: None, sir.

CHAIRMAN MILLER: Hearing none, Staff Exhibit 2 will be admitted into evidence.

(Whereupon, the document previously marked as NRC Staff Exhibit No. 2 was received in evidence.)

MR. HOEFLING: Thank you, Mr. Chairman. I'm giving the Reporter the appropriate number of copies for it to be bound into the record.

CHAIRMAN MILLER: Fine.

(The document referred to follows:)

Professional Qualifications

Carl B. Sawyer

Regulatory Improvements Branch
Division of Safeguards

My name is Carl B. Sawyer. I have been employed by the U.S. Nuclear Regulatory Commission (NRC) and its predecessor, the U.S. Atomic Energy Commission, since 1971. My duties with these agencies have been exclusively in the physical protection regulation of licensed nuclear plants and materials.

Currently I am a Senior Program Analyst with the Regulatory Improvements Branch. My duties are to plan and conduct programs, studies, and analyses for the protection of nuclear materials against theft and for the protection of nuclear plants against sabotage. As a part of my duties I review and evaluate current and proposed physical protection programs and equipment for overall adequacy in meeting the Commission's safeguards objectives.

Certain of my recent assignments pertain to the NRC's continuing evaluation of the possible need for physical protection measures for shipments of irradiated fuel. In August 1978 I was assigned to review a study entitled "Transport of Radionuclides in Urban Environs: Working Draft Assessment" (SAND 77-1927) and to advise the Division of Safeguards management in matters pertaining to the potential for sabotage of irradiated fuel shipments. I regularly represent the Division of Safeguards in meetings with the Department of Transportation in matters pertaining to the potential for sabotage of irradiated fuel shipments. I am participating in an NRC-supported research program to determine details of the response of irradiated fuel and fuel casks to attack by explosives.

I was one of the principal analysts in the program that led to the physical protection requirements for fuel fabrication facilities currently set forth in 10 CFR Part 73. Among my contributions were the initial concepts for dual barriers, dual alarm stations, access controls, communications, coordination with local police, entry and exit searches, and physical security plans. I prepared the criteria for NRC review of the Part 73 requirements for protection of fuel fabrication facilities. I was responsible for reviewing the initial implementation of these requirements at several facilities, incl (i) General Atomic, San Diego, California; (ii) Rockwell Inter Canoga Park, California; and (iii) Babcock and Wilcox in and Apollo, Pennsylvania.

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From 1956 to 1971 I was employed by various companies in the Washington, D.C. metropolitan area as an electrical engineer. My duties with the companies consisted largely of the design and development of components for advanced communications systems used by the Department of Defense and other agencies of the U.S. Government.

From 1954 to 1956 I served as a communications officer with the U.S. Air Force.

I graduated from North Carolina State College in 1954 with a BS in electrical engineering.

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MR. HOEFLING: Mr. Chairman, last Tuesday the Board requested that a knowledgeable individual apprise the Board and the public of the background and substance of the Commission's interim regulations.

BY MR. HOEFLING:

Q Now, Mr. Sawyer, have you reviewed last Tuesday's transcript of this proceeding?

A Yes.

Q Are you prepared to respond to the Board's request?

A Yes.

Q Would you do so, please?

A Now this is the part of the request that would deal with the content of the interim regulations.

Q The Background that led to those regulations and their content.

A Right.

Until recently the Nuclear Regulatory Commission had no specific physical protection requirements for spent fuel shipments.

MR. BLUM: Can you speak up, please?

THE WITNESS: The question of spent fuel shipments was first examined in NUREG-0170, or at least I choose to begin my story there, a document entitled Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes.

mpb2 This document was released by the NRC in December, 1977.

CHAIRMAN MILLER: What was the number of that NUREG?

THE WITNESS: NUREG-0170.

CHAIRMAN MILLER: Thank you.

THE WITNESS: NUREG-0170 with respect to sabotage of spent fuel shipments examined hypothetical sabotage in areas with up to population densities of 2000 persons per square mile.

It soon became apparent that there was a need to expand the information provided in 0170 to include treatment of sabotage in areas of high population density, and accordingly the NRC Staff undertook to contract a study which is now referred to as the -- by various titles, one of which is the Urban Study.

The document is designated SAND-77-1927. Its official title is Transport of Radionuclides in Urban Environs: A Working Draft Assessment. This document was produced by Sandia Laboratories, a suborganization of the Department of Energy. It was issued in draft form in June, 1978.

The document treats both safety and sabotage problems in high population density areas.

CHAIRMAN MILLER: Is it still in draft form,

POOR ORIGINAL

mpb3 Mr. Sawyer?

THE WITNESS: Yes.

And the official position of the Staff is that it's still under review by the Staff.

With respect to sabotage, the report examined many sabotage scenarios and concluded that radiological sabotage -- that is, sabotage that would result in significant radiological releases -- was crediblt only by means of explosive attack.

In order to reach these conclusions it was necessary, of course, to calculate the consequences, and in turn this led to a need for the analyst at Sandia to calculate the release fraction in hypothetical sabotage.

May I explain at this time that there have been no sabotage incidents with respect to spent fuel casks, and that there is no data base to draw upon. This left the people at Sandia with a problem in determining or arriving at the release fraction.

The Sandia view on the state of knowledge which they used in calculating the release fraction is reflected on page 177 of Sand-77-1927. And I will read from it for you two or three sentences from that passage:

"It must be emphasized that the material releases suggested and summarized here have not been verified experimentally. Although new

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programs have been proposed to investigate the nature of the releases resulting from explosive attacks, this has not yet been done. Therefore the considerations presented here are based on engineering judgment and the extrapolation of available data to the present study. With this caveat, the release estimates will be used as a source term to estimate the public consequences of the postulated attack."

Sandia went forward on the basis of a very limited amount of engineering data and a great deal of engineering judgment, and calculated the consequences of a release from a hypothetical spent fuel sabotage incident in the heart of New York City.

The results that Sandia arrived at in summary terms were tens of early fatalities --

CHAIRMAN MILLER: Pardon me.

I didn't understand that.

THE WITNESS: Tens, t-e-n-s.

CHAIRMAN MILLER: Thank you.

THE WITNESS: -- tens of early fatalities, hundreds to approximately 1000 early morbidities, and hundreds of latent cancer fatalities.

CHAIRMAN MILLER: Were the result of what, or assumed to be the result of what?

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THE WITNESS: This was the result arrived at by Sandia and were quoted in SAND-1927, the results arrived at for a hypothetical sabotage incident in the heart of New York City.

CHAIRMAN MILLER: A hypothetical sabotage incident in the heart of New York City.

Can you tell us any more about the means by which this was done, without getting into security matters? This is an assumption, as I understand you.

THE WITNESS: That's correct.

CHAIRMAN MILLER: What was assumed?

THE WITNESS: What was assumed.

CHAIRMAN MILLER: Now I don't want you to get into security matters. We don't want you to draw any blueprints about how you go about it, but nonetheless I'd like to have some general idea of what the assumptions were.

I understand it's in the report, so I suppose to that extent it's not classified.

THE WITNESS: That's correct, it's not classified. At least there is a great deal that can be said about it.

CHAIRMAN MILLER: Very well.

THE WITNESS: The New York City area was developed into several quadrants for purposes of analysis. The analyst used various times of day to account for population movement. The analyst postulated an explosive attack, an attack with

mpb6 explosives. The release fractions assumed were reported on page 133 of the report, and they are, in one instance, 100 percent of the noble gases, 1.6 percent of the cesium, one percent of other radionuclides. In another combination, 100 percent of the noble gases, 0.3 percent of the cesium, and 0.2 percent of other radionuclides. And in the third instance, 50 percent of noble gases, four percent of the cesium, and one percent of other radionuclides.

DR. LUEBKE: Mr. Sawyer, before you leave this area, does it say anything there about, aside from the radioactive emissions and their effect on people, the effect of the explosive on people?

THE WITNESS: Yes.

DR. LUEBKE: What does it say?

(Pause.)

THE WITNESS: Under the circumstances of a 4:30 p.m. rush-hour situation, the report points out that there will be about 17,000 people within a 600 foot radius of any given point, and postulates that an explosion occurs under these circumstances.

The report estimates 140 to 150 fatalities as a result of direct overpressure alone. I might add that many more people than this would likely be killed or injured from fragmentation, from parts of structures nearby, flying glass, flying debris. That's not included in the fatality estimate

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mpb7 of 140 to 150 fatalities.

The overall result is that this is comparable, at least comparable and perhaps higher than the immediate deaths resulting from the radiological consequences.

DR. LUEBKE: This one percent escape of gas could give that many fatalities?

THE WITNESS: Sir, I'm on dangerous ground and working at the motors of my expertise.

Let me explain, if I may, and then I'll attempt to answer the question you have asked.

At the NRC we work as specialists. My particular job is to attempt to estimate and advise on sabotage matters, including the spent fuel cask matter, to analyze matters up to the point where a postulated release of solids, gases, of the radioactive forms of material may be ejected into the environment.

At that point the problem becomes almost indistinguishable from a safety problem or otherwise a health effects analysis problem. And at that point we turn the problem over to a specialist in that field, and they calculate the consequences resulting from the release estimates that we made.

DR. LUEBKE: If I heard you correctly, in reading from the report, the releases were gases.

THE WITNESS: Not entirely. Gas was one component

mpbf of the release.

For example, in the first of the three cases that I mentioned, the releases were assumed to be as follows: 100 percent of the noble gases, 1.5 percent of the cesium and one percent of other radionuclides, meaning solids.

DR. LUEBKE: That's all gases to me. In other words, I visualize a puncture of a fuel element, and I would say that there would be zero cancer deaths immediately and a small number of possibly later cancer deaths. In other words, I don't see any radioactive emission that would be immediate deaths, like the explosion is.

THE WITNESS: In that sense of immediacy, I believe you're right. The early deaths occur within a period of weeks, as I recall, the early deaths from radiological consequences.

DR. LUEBKE: For that case one.

THE WITNESS: Yes.

Does that satisfy the inquiry concerning the effects of explosions, of the convection explosion itself?

DR. LUEBKE: Yes. And if anyone wants to inquire further they can read the report.

THE WITNESS: Returning, then, to the background of the new regulation, the responsible Staff members at the NRC were unwilling to face a new regulation on consequence estimates based on parameters with the large uncertainties

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which some of us felt were present in the Sandia document.

CHAIRMAN MILLER: Could you speak a little louder or get close to the microphone, please?

THE WITNESS: And accordingly -- I'm getting a little ahead of my story.

In the winter of 1978 and spring of 1978 the Staff, recognizing that there was going to be a data problem in the Sandia document, proceeded to make plans for a research program which would provide the needed experimental data.

We have an office of research in the Nuclear Regulatory Commission, and a request was formally submitted to them. A few months later, in the fall of '78, representatives of the research department reported back to us and indicated that the development of the kinds of data that we were asking for -- which I will describe in a momont -- would require a year to 18 months of research work, plus an additional delay in order to get the contract underway.

Therefore at the end of 1978 we found ourselves in a situation where we had a document from a highly reliable source projecting serious consequences in the event of sabotage of a spent fuel cask in a densely populated area. We had a need for additional information, but this additional information and additional experimental data in support of the conclusions that had been reached in the study would not be available for a year to 18 months.

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To further complicate the making of the necessary decision, we had a change of directorship in the office of nuclear materials safety and safeguards, and late in 1978 or perhaps early in 1979, a new director was appointed and was confronted with this problem. Our new director, Mr. Dircks, consulted with the Staff and made a number of observations.

It became the view of management that our present arrangement did not meet prudent practices for hazardous materials. We became concerned that we did not know when, where and exactly how these shipments were being made.

CHAIRMAN MILLER: How these what were being made?

THE WITNESS: The shipments were being made, we did not have details concerning this.

And the Staff was directed to consider or to develop a spectrum of alternatives for protection of the shipments.

The Staff had had considerable experience in the protection of shipments of radioactive materials, but not of spent fuel, of radioactive materials through our protection regulations for high enriched uranium and plutonium. We therefore considered a spectrum of alternatives commencing with the present arrangement of depending entirely on the massive construction of the casks and continuing upward through a system which would provide for detection and response from local law enforcement agencies, continuing

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upward through that to a system of protection which would include armed guards.

The result of our analysis in this area led us to recommend a system that would provide for detection and communication and liaison with local law enforcement agencies, and would provide us with the capability to request the assistance of these local law enforcement agencies in the event that a spent fuel shipment came under threat.

The basic objectives of our new protection program was to reduce the likelihood of high sabotage consequences by not permitting the transport of spent fuel through heavily populated areas. This work took place in March and April of this year.

The STaff was then faced with the question of advising management and the Commission concerning how these new requirements should be placed in force in the field. We considered several options here.

The options considered were license conditions, routine amendment of the regulation, and amendment of the regulations being effective immediately.

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Upon examining the license condition option a little further we found that there were legal effects and that option was removed.

Upon looking more closely, looking back over our track record or history of the time required to produce an amendment by routine procedures, that is, allowing for the full public comment period, the receiving of public comments and the analysis and incorporation of those into a regulation, we projected a period of many months to perhaps a year, possibly more, before such a regulation could be made effective.

We were unwilling to accept such a lengthy delay and accordingly, we decided to amend the regulations and make them effective immediately. This decision was reached in late March or early April of 1972.

On the 18th of April we sent a paper to the Commissioners recommending that course of action. The course of action was approved by the Commission on or about May 19th.

Simultaneously, the Staff was working on a guidance document. This is a document which amplifies the intent of the regulation. It gives multiple examples of ways that certain of the requirements can be carried out. It is not mandatory for the licensees, but merely advisory. This document is known as-- It's designated as NUREG 0561, and is entitled "Physical Protection of Shipments of Irradiated

POOR ORIGINAL

eb2 Reactor Fuel." It has been printed and is currently in process of distribution.

The rule itself was published in the Federal Register just a few days ago.

CHAIRMAN MILLER: Do you happen to have the date of publication and the number on that?

THE WITNESS: I do.

CHAIRMAN MILLER: May we have it, please?

THE WITNESS: The rule was published in the Federal Register of Friday, June 15th, 1979, Volume 44, Number 117.

CHAIRMAN MILLER: 44, 117?

THE WITNESS: Yes.

CHAIRMAN MILLER: Thank you.

THE WITNESS: I turn now to the part of the question which dealt with the content of the rule and how it might be carried out in practice.

The rule provides for the -- or places the following kind of requirements upon licensees. These general classes of requirements are:

A requirement for advance notification and route approval;

A requirement for arrangements with local law enforcement agencies;

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POOR ORIGINAL

Restrictions on the route that may be used to make

eh2 transient shipments;

Requirements for certain precautions for stops which are made en route;

Requirements that the licensee develop procedures for coping with threats and safeguard emergencies of shipments en route;

Requirements for driver and escort training, for communications, and for vehicle mobilization;

All the above factors for shipments by road.

The regulation also covers movement by rail and provides for a shipment log to be kept.

I can at this point go through in some detail the various measures that are provided for if this would be helpful to the proceeding.

DR. LUEBKE: I would be particularly interested in the mechanisms for calling for assistance when an accident occurred.

THE WITNESS: We require at least two persons to be in the cab of the transport vehicle or, alternatively, one person can be in the cab, that is, the driver, and an escort vehicle, that is, a separate escort vehicle can be used.

Either the transport or the escort vehicle must be equipped with a radio-telephone and CB radio or some other -- I should say in lieu of the telephone, the licensees may

b4 provide some other radio equipment of equivalent performance.

Another part of the requirement provides that arrangements must be made with local law enforcement agencies along the route, and the method which is suggested in our guidance document, NUREG 0161 are --

MR. HOEFLING: I believe for the record that's 05612

THE WITNESS: Thank you.

The method that's sued for putting down the needed

100 communication down is referred to as a route overview. The route overviews would be performed initially by the NRC specialists trained in this duty. They would analyze the route over which the shipment is to be made, break it into segments, visit the various local law enforcement headquarters along the route, explain the nature of the shipment, solicit their cooperation of the law enforcement agency, determine the sphere of jurisdiction of the law enforcement agency, collect data on the response time in the event of a call for assistance or in the event assistance is requested by the shipment vehicle. These things all would be done by the Nuclear Regulatory Commission Staff on a one-time basis, and provided to the licensee who would then be responsible for keeping the material current.

In the actual cab or in the escort vehicle, the escort would have available what we refer to as the route

ab5 overview sheet. The sheet which I'm looking at which appears in NUREG 0561 covers approximately a 160-mile segment of an example route.

It gives the telephone numbers of police headquarters units along the route. It indicates what, if any, channels of citizen band radio are monitored by the police, and indicates whether or not radio-telephone is likely to work along any given specific segment of the route.

In the event of a problem or a threat to the shipment, it is expected that the escort would use his communication system to notify the police station noted in the route overview, and that the police in that jurisdiction would respond.

DR. LUEBKE: Is that the completion of the arrangements? I didn't see any notification in there of the Department of Energy response teams which I understand are located in eight regions of the country. Is that being considered at all?

THE WITNESS: I don't know the answer. The response teams are not treated in the guidance document.

DR. LUEBKE: To amplify this a little more, I would like to take official notice at this time of a document issued by the Comptroller General, Report to the Congress, entitled "Federal actions are needed to improve safety and security of nuclear materials' transportation," and that is

eb6

numbered EMD79-18, dated May 7, 1979.

It has in it a Chapter 4 on page 25 titled "Better response needed for transportation accidents." And one of the early subtitles in that chapter is "Improvements needed in state and local preparedness."

I think many of the preparations have to do with when you call the sheriff's office or the police department, they may come out and direct traffic. I'm a little concerned about who takes care of the radioactivity, and therefore, I bring this chapter up.

On page 26 of this same chapter there's a subtitle, "Federal role," and that is the chapter in which it is explained that there are these DOE emergency response teams in eight regions of the country, and these are experts in handling radioactive incidents. They have instruments and are trained.

I would imagine that the NRC regulations, before they are completed in detail, would have some means of using these facilities.

It is complicated a little bit by the next subtitle which on page 27 reads:

"Federal reorganization of emergency service."

I suppose this is something that has to be suffered through, and it even suggests that GSA might become responsible

eb7 for leadership and coordination of emergency response planning for nuclear accidents.

I bring this to your attention because before it is all complete, I think these matters need to be reconciled.

MR. HOEFLING: Mr. Chairman, may I comment?

CHAIRMAN MILLER: Yes.

MR. HOEFLING: I think that there may be some problem taking official notice of this document in the sense that it would have some evidentiary weight were that the case, and the document is as I say prepared by the General Accounting Office, and I don't believe that the Staff could concur in all the findings that are made in that document because if covers a variety of areas.

I think certainly you can recognize the document and obviously we know about it, and the STaff is aware of it and is considering it. That's certainly the case.

As far as the emergency response teams are concerned, the Staff will later today present two gentlemen who will be in a position to respond to Dr. Luebke's concern in that area as to what these teams are -- what their function is and how they operate.

CHAIRMAN MILLER: Very well.

Well, we will take official notice of that portion of the document which has been referred to by Dr. Luebke which I think identified Chapters 4 and possibly 26, and with

eb8 reference to the emergency response teams.

I understand the Staff will have witnesses that will address this subject?

MR. HOEFLING: Yes, Mr. Chairman.

CHAIRMAN MILLER: You may proceed.

BY MR. HOEFLING:

Q Are you completed with your statement, Mr.Sawyer?

A Yes, I am completed. As I recall, I was responding to or had completed response to a question on communications and we then moved into the discussion of the GAO document.

MR. HOEFLING: At this point, Mr. Chairman, the next function for Mr. Sawyer would be to update the EIA, and I would go forward with that unless there are any other outstanding questions.

CHAIRMAN MILLER: Very well, you may go forward.

le MR. HOEFLING: The Staff would mark for identification as Staff Exhibit Number 3 a document entitled "Environ-

5.230 mental Impact Appraisal Related to Spent Fuel Storage - Oconee Spent Fuel at McGuire Nuclear Station Unit 1 Spent Fuel Pool," dated December 1978.

I will give a copy to the Reporter. We will give him three copies.

(Whereupon, the document referred to was marked Staff Exhibit 3 for identification.)

MR. HOEFLING: Mr. Chairman, at this point I would like to explain --

MR. BLUM: Mr. Chairman, does this have a number?

MR. HOEFLING: It has no number.

CHAIRMAN MILLER: The Staff Environmental Impact Appraisal filed in this particular proceeding is Staff Exhibit 3.

MR. BLUM: That's what I want.

MR. HOEFLING: The procedural plan we will follow, Mr. Chairman, is to mark this for identification now and then, as witnesses take the stand and deal with the subject area that requires updating or changes, the witness would make the changes at that time.

BY MR. HOEFLING:

Q Mr. Sawyer, do you have a copy of Staff Exhibit Number 3 before you?

A Yes, I do.

Q Would you turn to page 17?

A I have it.

405 087

Q The section there entitled "Sabotage of Spent Fuel," subsection 3.4.1, "Transport.

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eb10

A Yes.

Q Do you want to update that portion of the document to reflect recent Commission actions?

A Yes. I have several changes.

Q Would you do that?

A Very well.

Commencing at the second line, I would place a period after the word "sabotage," strike the words which follow "and is specifically exempt from the physical protection requirements of 10 CFR Part 73," and replace those words with "Shipments will be protected in accordance with the requirements of 10 CFR Part 73 and," and in the third line change the "M" in "Massive" and change it to a "m." That completes the changes to the first paragraph.

In the second paragraph, the second sentence, strike the words "cannot be" and replace them with the words "would be very difficult to."

In the same sentence, delete the "d" from the word "removed."

Between the second and third sentences, insert the following additional sentence:

"Absent shielding, an individual who was successful in removing the cover would be exposed to lethal radiation."

Begin the next sentence after "lethal radiation"

ebll with the words "In practice," and return now to the original text. Change the "O" of "Overhead" to a "o."

CHAIRMAN MILLER: Do you want to strike the word "which."

THE WITNESS: Nothing is stricken in the current sentence I'm working on but, rather, change the "O" in the word "Overhead" to a "o."

Continuing in that same sentence, strike the words "would have to be" and replace them with the word "are."

In the next line, following the word "and," insert the word "for."

In the next line, strike the words "would have to be" and replace them with "is."

That completes the corrections on page 17.

I now turn to the next page.

In the eighth line in the sentence which begins "Although the cask," strike the word "determined" and replace it with "believed."

MR. BLUM: I'm sorry, I lost you. Where are you?

THE WITNESS: I'm on page 18, line 8, in a sentence which begins "Although the cask was severely deformed," strike the word "determined" and replace it with "believed."

In the next line, strike the words "fixed position."

In the second line below that, strike the words

eb12 "essentially impossible" and replace them with the word "possible." Insert a comma on that same line after the word "cask." On that same line strike the words "on a large scale. However," and replace them with the word "and."

Two lines further down, strike the words "expert knowledge."

Two lines below that correction a sentence begins "These tests indicated that." Strike the words "indicated that" and replace them with "and related."

In the next line strike the words "the practical limit" and replace them with the words "calculations support," and continue with the words "a conservative estimate." The full insertion would then read:

> "Calculations support a conservative estimate."

In the next line strike the words "would be" and replace them with the word "of."

STrike the next sentence in its entirety, and the referenced footnote double-asterisked. Replace it with the following sentence:

> "However, the estimate is subject to large uncertainty."

In the first line of the next paragraph, strike the words "an occurrence" and replace them with the words "a release."

eb13

That completes the changes.

BY MR. HOEFLING:

Q Mr. Sawyer, as changed, is that Section 3.4.1 now correct?

A Yes.

MR. HOEFLING: Mr. Chairman, that completes the Staff's presentation.

CHAIRMAN MILLER: Any cross-examination of Mr. Sawyer?

Mr. Blum?

MR. BLUM: I'd like to know what I may go into in this matter. We finally have the effects, at least the partial effects of the regulation on this particular hearing brought forth now. This is the first time that I know of, coming to our knowledge. And I would like to question Mr. Sawyer about different aspects of what he has just testified about, which would include sabotage.

CHAIRMAN MILLER: Well, so far your statement of intent seems to be in accordance with your rights and privileges.

MR. BLUM: Fine.

CHAIRMAN MILLER: You may proceed.

CROSS-EXAMINATION

BY MR. BLUM:

Q I heard you testify, Mr. Sawyer, about two people

ab14

in the cab or two people and an escort vehicle. Would that cover the entire route, all 170 miles of this particular route?

A I do not understand the phrase, "this particular route."

Q Do the regulations require, the new regulations, do they require having an escort vehicle or guard over this entire route from Oconee to McGuire?

A There is-- The phrase "the route" gives me a bit of a problem. We have no route which has been approved by our licensing organization.

Q If you can turn back to page 9 in the Environmental Impact Appraisal, Figure 2-6?

A I have it.

Q All right.

Now you're testifying that that is not the-- Is that not the planned route?

A It is the route that has been proposed by the Applicant and has been considered. But this route must be examined by Route Review Teams of the Division of Safeguards before the Licensee can use it.

Q And that is a part of this new regulation?

A That's correct.

Q So as things sit here, because for example this route goes through the City of Charlotte, it might not be

eb15

accepted by your Review Team?

A That's correct also.

Q Assuming for a minute that this is in fact a route that will continue to be proposed and is accepted, as I understand the regulations they only require the additional escorts in places where the population is over 100,000 people. Isn't that true?

A The statement as you phrase it is not entirely accurate. May I amend it in the following way?

Q Yes, sir.

A In the case of Charlotte, it would be-- The area which would be embargoed would be the city area with a population of 100,000 as you have just mentioned, plus three miles beyond the boundary.

5.500

Q So outside that area there is no requirement for an additional escort, that is, in addition to the driver of the truck?

A There is no need for an armed escort. Does your word "escort" mean armed? Does it imply armed?

Q That's correct, there is no need-- It would be an armed escort, or an additional car, or whatever you're talking about.

A There is no need for an armed escort outside of the Charlotte area, plus a three-mile limit in the hypothetical situation we're talking about.

Q How does the driver have to have a radio, some sort of a CB or radio-telephone equipment the whole route, or only in a city and environs of over 100,000?

A He must have the capability for communication the whole route.

May I amend that? He must have an operative CB radio and an operative radio-telephone or the equivalent.

The reason I amend the statement is in some isolated areas there is difficulty in guaranteeing the operation of a radio-telephone.

CHAIRMAN MILLER: You used the conjunctive "and." You mean he must have both methods of capability?

THE WITNESS: Two items of equipment, that's correct.

BY MR. BLUM:

Q In this route shown on Figure 2.6, the truck goes by Clemson University, Greensville, Spartansburg, and Gastonia, In those four places there would be no need for the armed escort, according to the regulations?

A That's correct.

Q We have had some testimony here about the possible annual release of the cask coolant taking under one-half an hour if an individual were so inclined.

Do you know if that possibility was considered in the sabotage study?

eb17

MR. HOEFLING: Objection, Mr. Chairman. I think we're getting outside of what Mr. Sawyer is here for, which is to present the status of the Commission's regulations in this area, and their substance to the Board, and to respond to--

CHAIRMAN MILLER: Mr. Sawyer has presented them. But you take the position that he's not qualified to interpret them or to apply them to the situation as suggested by Counsel on cross-examination?

MR. HOEFLING: Well, I think what we have seen here by CESG is a question that is linked, at least in my mind, quite clearly to the proposed contention on sabotage.

CHAIRMAN MILLER: It might well be, but there is a contention on sabotage. Our action the other day did not allow a contention on sabotage on an untimely basis to be entered by CESG. That doesn't have anything to do with the

562 pending sabotage issue as framedby -- I think it's Contention 6 of NRDC and whatever the status of that is.

MR. HOEFLING: Mr. Chairman, it's my understanding that that contention has been effectively withdrawn.

CHAIRMAN MILLER: I don't know. I haven't heard that. I've heard no stipulation of withdrawal. I just take the record as it is.

I've heard a series of statements and I've heard some possible implication that it might or might not be --

MR. HOEFLING: I would suggest that the appropriate time to inquire -- for CESG to inquire into this area would be when a witness is presented to address that contention. And this is not what is taking place here.

If indeed the NRDC contention is live in this case, there will be testimony taken on that issue, and that would be the appropriate time to press an inquiry, and not at this time.

CHAIRMAN MILLER: At the present time there is a live contention of sabotage. We simply ask that the record reflect what action, if any, has been taken by the Commission at the recommendation level since that contention was admitted into this case, and that I understood was what you put Mr. Sawyer on for.

MR. HOEFLING: He was not put on to respond to the sabotage contention, Mr. Chairman. He was not offered to respond to that contention.

CHAIRMAN MILLER: Well, what was he offered for?

MR. HOEFLING: He was offered to apprise the Board and the public of the present status of the Commission's regulations in this area, and to respond to a question from Mr. Luebke, and to update the EIA to make it reflect what has transpired since the issuance of the document toward the end of 1973.

If the NRDC contention remains in the proceeding

eb19

and the Chairman is correct there is no stipulation at this time that officially withdraws it, then certainly the Staff would be prepared to go forward and offer a witness on that contention, at which time cross-examination would follow. And I would suggest that we wait until that time comes, rather than burden the record at this point.

That would aid the record. It would make the record complete on that contention. There would be one portion of the record dealing with that contention, rather than having cross-examination of witnesses who may not even be the witnesses that are presented to address the contention scattered through the record.

CHAIRMAN MILLER: Well, I don't know exactly why the Staff put the witness on, but you certainly have the record now showing significant -- at least not insubst changes in the section of the Environmental Impact Appraisal 3.4, Sabotage of Spent Fuel, and you certainly got that in the record before Counsel for CESG and others. You certainly have the present status of the regulation by the Commission which has a direct bearing upon transportation and the possibility of sabotage. The whole issue is of record.

I don't see why the Staff contends that you can go to that extent and then shield the witness, who at least has taken that step forward, from cross-examination. It seems a very strange method of procedure.

ek20

MR. HOEFLING: Well, Mr. Chairman, the method of proceeding in these cases traditionally is for the Staff to place into evidence its documents which are the FES and the Environmental Report.

CHAIRMAN MILLER: This is not a traditional proceeding. Why do you tell us what you do traditionally when that is not what is happening here? You don't have an FES, you [illegible] have a DES, you have a wholly different situation, so why do we talk about things in the abstract? We're here and now.

MR. HOEFLING: May I have one moment, Mr. Chairman?

CHAIRMAN MILLER: You certainly may. As a matter of fact you may have a few moments because we'll recess at this time for lunch, and we'll resume at 1:15, a quarter past 1:00.

(Whereupon, at 12:05 p.m., the hearing in the above-entitled matter was recessed to reconvene at 1:15 p.m. the same day.)

End Bloom
Landon fls.

POOR ORIGINAL

A F T E R N O O N S E S S I O N

(1:15 p.m.)

CHAIRMAN MILLER: Are we ready to proceed, ladies and gentlemen?

Mr. Hoefling, I think you had raised a question as to the nature and extent of cross-examination that was available of Mr. Sawyer.

MR. HOEFLING: I note that Mr. Blum is not here, Mr. Chairman. I hesitate to go forward before he arrives.

CHAIRMAN MILLER: Mr. Riley, do you know where your lawyer is?

MR. RILEY: The last I saw him was in his office. He's presumably on his way here.

(Pause.)

CARL B. SAWYER

resumed the stand as a witness on behalf of the NRC Regulatory Staff and, having been previously duly sworn, was examined and testified further as follows:

CHAIRMAN MILLER: I was about to inquire of counsel, Mr. Hoefling, whether the testimony as submitted by Mr. Sawyer is intended merely to bring for the record the nature and wording -- the nature of the wording of the regulation recently adopted on a 30-day basis by the Commission, as identified, and is acting solely as scrivener to indicate the changes which it is intended to make in the sabotage of

around fuel section of the Staff's Environmental Impact Appraisal? Is that the extent of it?

MR. HOEFLING: Mr. Sawyer was offered for a very limited purpose, and I think you characterized what those intentions were.

CHAIRMAN MILLER: Well, I'm not sure that the Board was advised that it was that narrow, but I'm also not certain whether or not he may have expressed opinions in the course of describing the change.

But if he did express any opinions, they will be stricken. His testimony will be considered to be limited, of record, to a description of the Sandia study and the resulting proposed regulation or regulation adopted by the Commission, simply indicating those portions of the Environmental Impact Appraisal, Staff Exhibit 3, where it is proposed that changes will be made.

We will consider that before any of these things are effective that the Staff is going to put on testimony by some witness who may be cross-examined on such matters.

MR. RILEY: Mr. Chairman, in the absence of counsel, may I be heard?

CHAIRMAN MILLER: You may be heard, but you can't really say much, because you haven't been hurt. In other words, we've limited it and we've stricken any opinions. So there's really nothing before us currently.

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MR. RILEY: I would like to add that he also discussed the process by which the NRC arrived at its approach to the studies.

CHAIRMAN MILLER: Well, insofar as that was factual matters, I assume that there will be a witness who may be cross-examined substantively.

We're regarding Mr. Sawyer at the moment -- he might be the witness, I don't know -- but for the moment we're regarding him simply as a scrivener and as a tenderer of certain information factual in nature, from which we're not to infer anything, and if there be any expressions of opinion-- that we don't now recall -- they will be considered stricken.

MR. HOEFLING: Mr. Chairman, may the Staff be heard?

CHAIRMAN MILLER: Yes.

MR. HOEFLING: I'd like to make a comment on the Board's ruling.

The Staff's view of this proceeding is that it is a routine proceeding involving an amendment to a license application, and has no extraordinary aspects to it.

That being the case, we would point the Board to the Commission's Rules of Practice, specifically to Rule 2.743(g), dealing with evidence, which requires that the Staff place its SER and environmental documents into evidence, and --

CHAIRMAN MILLER: Well, first, we don't agree that it's routine. Secondly, you don't have an SER, I don't believe, do you?

MR. HOEFLING: Yes, we do.

CHAIRMAN MILLER: All right. Then you have an SER which will be placed into evidence, which is required to be placed in evidence. But I don't think that you have a DES or an FES, do you?

MR. HOEFLING: No. Mr. Chairman, Staff construes the rule as applicable to the Environmental Impact Appraisal, which is basically an environmental analysis, although different in title from the --

CHAIRMAN MILLER: Well, it also may be controverted.

MR. HOEFLING: Pardon me?

CHAIRMAN MILLER: I say the adequacy of it may be controverted, whether or not a safety evaluation was or was not required. Staff taking the view that it was not, and hence using the negative impact study, and the like, is subject to be controverted.

MR. HOEFLING: The point I wish to make is that we treat this proceeding as routine --

CHAIRMAN MILLER: We don't. Let's just stop right there. You've said it twice, and it's not a routine proceeding.

MR. HOEFLING: Yes, Mr. Chairman. May I go

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1 forward with my remarks?

2 CHAIRMAN MILLER: You may.

3 MR. HOEFLING: And being that that is the Staff's

4 view, we intend to place the Safety Evaluation and the

5 Appraisal -- or at least move that those documents be admitted

6 in evidence, and we would follow the approach which we

7 normally follow in these proceedings, which is to present

8 the documents and to make whatever corrections are required

9 in the documents, even though those corrections are beyond

10 the issues in controversy, and that point have the documents

11 accepted into evidence.

12 This is the approach we have taken with Mr. Sawyer

13 at this point. Given that there's a possibility that there

14 will be a sabotage issue at a later point, at this point

15 Mr. Sawyer is being offered as if there were no sabotage

16 issue, merely to correct the EIA, and not to be exposed to

17 substantive cross-examination.

18 CHAIRMAN MILLER: All right. We'll make it

19 simple.

20 We strike the entire testimony of Mr. Sawyer.

21 We consider him withdrawn as a witness.

22 You may offer what you like in the way of

23 documents. When we get to controverted matters -- this is

24 not a routine procedure. There's a sharp conflict in this

25 case, as to whether or not Staff's consideration of the facts

1 but circumstances justify their changing to an not
2 involving a unfavy Evaluation report and [illegible] study,
3 or whether the Staff is correct in its and [illegible] whether
4 the negative impact proper.
5 That is a controverted issue.
6 So we'll just straighten the record out and just
7 strike all the testimony and go from there.
8 Next witness.
9 MR. HOEFLING: Is Mr. Sawyer excused now, Mr.
10 Chairman?
11 CHAIRMAN MILLER: Yes, he's excused.
12 We know, by the way, that he and another gentleman
13 have filed some testimony, so this is without prejudice to
14 him along with the other witness testifying, and so forth.
15 We just regard it as having not yet occurred, and there
16 being no testimony.
17 And if you wish to offer into evidence the Staff
18 Exhibit 3, it has to go into evidence anyway, and you're
19 going to have to have somebody that's going to explain those
20 changes. But I assume you will do that at such time as you
21 deem it appropriate in the presentation of your case.
22 MR. HOEFLING: At this point we would call Dr.
23 C. Vernon Hodge and Mr. Resley O. Glenn.
24 MR. BLUM: Mr. Chairman, there was some discussion
25 as to at what point Mr. Riley would testify, and I had

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1 assumed -- at least the content of the negotiation or
2 discussion was that we were going to try and work around a
3 meeting that Mr. Riley had at his work place out here, and
4 I thought that he was going to be the first witness this
5 afternoon.
6 CHAIRMAN MILLER: Well, I don't know about your
7 order of witnesses.
8 MR. HOEFLING: There's no problem with that, Mr.
9 Chairman, as far as Staff is concerned.
10 MR. BLUM: Well, we're ready for that.
11 CHAIRMAN MILLER: Do you wish to call Mr. Riley
12 to testify? Is that your purpose?
13 MR. BLUM: Well, at some point. We're ready for
14 that. And, of course, we're ready for these other witnesses
15 too.
16 CHAIRMAN MILLER: If there's some problem with
17 his being able to testify now and not at some other time,
18 I think, if Staff has no objection --
19 MR. KETCHEN: Mr. Chairman, may I be heard?
20 CHAIRMAN MILLER: Yes.
21 MR. KETCHEN: This is going very fast for me.
22 But we were going with one procedure, now, and
23 suddenly I've just been handed a document that I've never
24 seen before, as far as I know, called, "Testimony of Jesse
25 L. Riley," and then suddenly a proffer of Jesse L. Riley as

to witness.

CHAIRMAN MILLER: Wasn't that prefiled? We have some prefiled testimony of Mr. Riley, haven't we?

MR. KETCHEN: None that I know of.

CHAIRMAN MILLER: Let's find out.

MR. BLUM: What we've done, Mr. Chairman, is to retype the testimon, -- it's basically the same material that's in his prefiled testimony, with some --

CHAIRMAN MILLER: Well, stop a minute, and let me simply identify the document, so that the Board knows where we stand and so that Mr. Ketchen knows.

There was filed, and we have received, a document denominated, "Intervenor CESG Response to NRC Staff's Motion for Summary Disposition," in the form of the testimony of Jesse L. Riley.

We received it on June 12, 1979. I don't know when it was mailed. There's a certificate of service by mail dated June 7, 1979.

We considered that this purported to be the prefiled testimony of Mr. Riley.

MR. BLUM: There's a parallel document addressed to the Applicant's motion as well.

CHAIRMAN MILLER: What do you mean, "parallel?" Copies?

DR. LUEBKE: Is it identical?

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1 MR. BLUM: It's not identical.

2 Mr. Riley responded to both the Staff and the

3 Applicant's motions in two separate documents filed the same

4 time. One was mailed -- the second one was mailed on the

5 11th.

6 CHAIRMAN MILLER: Where do we stand? What have

7 you got? What are you going to do?

8 MR. BLUM: What we did was, since we had those

9 two documents, and since the first couple of pages of those

10 documents was in the nature of argument, which is improper

11 in testimony, and since the sabotage material appeared to be

12 no longer appropriate -- at least at that point -- what we

13 attempted to do was condense the two documents, put them

14 together in the form of one piece of testimony.

15 CHAIRMAN MILLER: Do you have enough copies to

16 give to everyone?

17 MR.BLUM: I have enough copies to mark at this

18 time.

19 CHAIRMAN MILLER: Can you tell us for the record

20 where the changes have been made from the so-called prefiled

21 testimony? In that event, we'll know what it is you're

22 offering, without any great to-do.

23 If you're not able to do that, then you're going

24 to have to get, I suppose, the consent of counsel, at least

25 to examine, because they do have a right to be apprised. You

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say there are no differences. Well, . . .

MR. BLUM: I'm saying that there's nothing new in the third document. There's nothing in the third document that wasn't in the first two. The two are integrated, and portions are struck. It's more struck than added.

CHAIRMAN MILLER: How long will it take the Staff to read the new integrated single version and be prepared to go ahead?

MR. KEYCHUN: Mr. Chairman, I think we should go ahead with the transportation panel. It will take some time.

I've spent many, many hours on the other documents, and had lots of arguments about, legal arguments, on the inadequacy of testimony. And even though there may not be new information, there could be nuances and so forth and so on.

It's a real curve ball, and you just can't do that on 10 pages of testimony -- or however much it is -- 13 pages of testimony, in a few minutes.

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I could probably do it overnight.

CHAIRMAN MILLER: All right.

Mr. Riley, I'm afraid we're not going to be able to hear you now, because you're going to have to file whatever it is you're going to file. You're going to have to continue to pre-file testimony, and you'd better file it as soon as you possibly can. We will permit testimony, say,

tomorrow morning, or sometime such as we can work out.

Do you have any difficulty having Mr. Riley here in the morning?

MR. BLUM: No, sir.

MR. MC GARRY: Mr. Chairman, I might note that after an appropriate recess, the Applicant might be prepared to go forward with its cross-examination of Mr. Riley, and we will endeavor to try to --

CHAIRMAN MILLER: Well, there's no point in starting it and then not having the Staff ready. I think we'd better do it together. The cross-examination of Mr. Riley we think should be at the same time as the Staff's.

MR. MC GARRY: I agree with you, Mr. Chairman. It just may very well be that, come 3:30 or 4:00 o'clock, we'll have a gap, and at that time --

CHAIRMAN MILLER: Oh, you anticipate a possible gap?

MR. MC GARRY: Because the Applicant's case cannot go forward absent Mr. Roisman, and what I would suggest at that time, if that situation eventuates, we can begin with Mr. Riley and we'll take him up to the logical stopping point, and the Staff can pick up in the morning, if that occurs.

CHAIRMAN MILLER: All right. This is a possibility.

Now, I think Mr. Roisman indicated he had no objection to proceeding with Dr. Hamilton, Garrick, Jones,

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Collins -- if he came, Carlson, and Mr. Riley.

There seems to be a question about Mr. Elliott, was it?

MR. MC GARRY: Mr. Elliott?

CHAIRMAN MILLER: There seems to be some question. My notes don't show whether we could go forward with him in Mr. Roisman's absence.

MR. MC GARRY: He will not be called. He was our sabotage witness. He will not be called. So that leaves the Applicant with two witnesses -- or three witnesses:

Mr. Sterrett and Mr. Lewis will be on tomorrow, and then Dr. Garrick will be back on Friday.

CHAIRMAN MILLER: Who?

MR. MC GARRY: Dr. Garrick will be back on Friday.

CHAIRMAN MILLER: And that's the Applicant's testimony?

MR. MC GARRY: That will be the Applicant's case, yes, Mr. Chairman.

CHAIRMAN MILLER: All right.

That's a good suggestion. If we should run short, we'd like to move right along.

As a matter of fact, we'll probably start at 8:00 o'clock hereafter for the balance of the week, and if necessary we'll consider a night session. Because we do want to get all the evidence in and close the record by Friday.

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Perhaps we'll have a better idea tomorrow or the next day of how we're progressing, but in any event, in case we forgot to mention it, we will start at eight o'clock for the balance of the week.

MR. MC GARRY: Thank you.

CHAIRMAN MILLER: Would someone see that Mr. Roisman is notified?

MR. MC GARRY: I've attempted to contact Mr. Roisman on two or three occasions concerning Dr. Garrick's testimony. I will note for the record that I Sprinted the testimony to Mr. Roisman. I spoke with the secretary this morning. She had handed him the document. But I've not been able to get in touch with him.

CHAIRMAN MILLER: If anybody is in touch or capable of being in touch with Mr. Roisman, mention to him -- Mr Blum, you might be able to also -- eight o'clock in the morning.

You might mention also to him the possibility of an evening session in the event that there's any question that we'll be able to finish the evidence. All right?

Your suggestion is a good one, Mr. Mc Garry. We appreciate it. We do have some kind of a hiatus here. We may well proceed with Mr. Riley.

I take it now Mr. Riley's testimony has been distributed. The Board doesn't have it. Let's have that distributed right now we that the people at least will have

WEL/ebl

the capability of looking at it.

MR. BLUM: Well, everyone other than the Board has that. Do you want me to distribute it to--

CHAIRMAN MILLER: Well, distribute it to Counsel who have not received it and let the Board have three copies.

(Documents distributed.)

MR. KETCHEN: May I inquire, Mr. Chairman, of Counsel whether he distributed copies of the professional qualifications of Mr. Riley that was given to us on Saturday?

MR. BLUM: I've distributed those to Counsel but not the Board.

CHAIRMAN MILLER: Well, then I guess all you have to do is give the Board copies, both of the qualifications and of the proposed testimony of Mr. Riley.

(Documents handed to the Board.)

WEL 4

MR. BLUM: I have three copies of the qualifications of Jesse L. Riley and three copies of the document marked Testimony of Jesse L. Riley.

CHAIRMAN MILLER: Would you like to have those marked for identification so that we'll have a record then, Mr. Blum?

MR. BLUM: Yes.

CHAIRMAN MILLER: I don't recall what the numbers are but if you'll tell us --

MR. BLUM: I don't recall either.

WRL/ eb3

(Pause)

CHAIRMAN MILLER: You've got at least three, apparently.

Page 1214 of the transcript shows that there were three exhibits which were identified as CESG 1, 2 and 3.

MR. BLUM: Mr. Chairman, then can we mark the statement of professional qualifications of Jesse L. Riley as Exhibit Number 4 for CESG, and the testimony of Jesse L. Riley as Exhibit Number 5 for CESG?

I have handed up three copies of each to the Reporter.

CHAIRMAN MILLER: All right. The documents will be so marked for identification. They have been distributed, as we understand it now, to the Board, Counsel and to the Reporter.

(Whereupon, the documents referred to were marked CESG Exhibits 4 and 5 for identification.)

CHAIRMAN MILLER: It is possible that we may start with the testimony or the offered testimony of Mr. Riley, including perhaps cross-examination by Applicant as suggested if we have enough time and no witnesses later in the afternoon.

The Staff however will have the choice to permit his cross-examination of Mr. Riley in the morning.

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MR. WRIGHT: I would just like to register my displeasure with this procedure. It has happened in other proceedings. When the Staff Counsel come down here, we usually try to be prepared for cross, but we find that in other proceedings, this is going to continue to happen and the rules provide a lengthy time so that we may prepare our cross-examination. To do this burdens us and takes us away from preparation for our witnesses. And that's the end of my comment.

CHAIRMAN MILLER: Well, the record will reflect your unhappiness. I guess there's not much we can do at the moment. We do encourage, of course, all Counsel and all parties to file promptly whatever papers are to be filed. That's about the most we can do.

All right, gentlemen. Will you stand and be sworn?

Whereupon,

C. VERNON HODGE

and

RESLEY D. GLENN

were called as witnesses on behalf of the NRC Regulatory Staff and, having been first duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. HOEFLING:

Q Dr. Hodge, state and your name and position for

the record.

A (Witness Hodge) My name is C. Vernon Hodge. I'm an employee of the Nuclear Regulatory Commission, in the Office of Nuclear Material Safety and Safeguards, Transportation Branch.

MR. HOEFLING: Mr. Chairman, I'd like to have marked for identification as NRC Staff Exhibit Number 4 a document entitled, "Professional Qualifications, C. Vernon Hodge, Transportation Branch, Division of Fuel Cycle and Material Safety," consisting of three pages.

CHAIRMAN MILLER: The document may be so marked.

(The document referred to was marked for identification as Staff Exhibit 4.)

BY MR. HOEFLING:

Q Mr. Hodge, do you have Staff Exhibit Number 4 before you?

A (Witness Hodge) Yes, I do.

Q Did you prepare it?

A Yes, I did.

Q Is it correct?

A Yes, it is correct.

MR. HOEFLING: Mr. Chairman, the Staff would move that Dr. Hodge's qualifications be admitted into evidence.

CHAIRMAN MILLER: Is that separate from the proposed testimony of Mr. Sawyer and Mr. Hodge? We don't seem to have it.

MR. HOEFLING: Mr. Chairman, I can provide the Board with copies.

CHAIRMAN MILLER: Fine. That one, none of us has.

MR. BLUM: It's attached to the affidavit of Hodge and Glenn, which addresses (a) and (b)

MR. HOEFLING: It's attached to the affidavit filed on the summary disposition motion.

CHAIRMAN MILLER: That may be why we didn't have it.

MR. HOEFLING: I'm also going to distribute to the Board copies of Mr. Glenn's qualifications.

(Documents distributed.)

CHAIRMAN MILLER: All right.

We have now Staff Exhibit 4, which is the statement of professional qualifications of Mr. C. Vernon Hodge.

Is there any request for voir-dire examination of the qualifications?

MR. BLUM: No, sir.

CHAIRMAN MILLER: Is there any objection to the qualifications?

MR. BLUM: No, sir.

CHAIRMAN MILLER: Staff Exhibit 4 is admitted into

1 evidence.

2 (The document heretofore marked
3 for identification as Staff
4 Exhibit 4 was received in
5 evidence.)
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1 MR. HOEFLING: Mr. Chairman, Staff would now ask
2 that a document bearing, in the upper left-hand corner, the
3 name Resley D. Glenn, Senior Development Engineer, Environ-
4 mental Evaluations Section, Occupational and Environmental
5 Safety Department, Battelle Pacific Northwest Laboratory,
6 consisting of one page, be marked for identification as Staff
7 Exhibit Exhibit Number 5.
8 CHAIRMAN MILLER: So marked.
9 (The document referred to was
10 marked for identification as
11 Staff Exhibit 5.)
12 BY MR. HOEFLING:
13 Q Mr. Glenn, would you state your name and position
14 for the record?
15 A (Witness Glenn) My name isResley Glenn. I'm
16 senior development engineer in the Environmental Evaluations
17 Section of Battelle Pacific Northwest Laboratory.
18 Q Did you prepare Staff Exhibit Number 5?
19 A I did.
20 Q Is it correct?
21 A Yes.
22 MR. HOEFLING: Mr. Chairman, the Staff would move
23 that Staff Exhibit Number 5, the qualifications of Mr. Glenn,
24 be admitted into evidence.
25 CHAIRMAN MILLER: Any request for voir-dire

examination?

MR. BLUM: No.

CHAIRMAN MILLER: Any objection to the statement of qualifications of Mr. Glenn?

MR. BLUM: No objection.

CHAIRMAN MILLER: There being none, it will be admitted into evidence as Staff Exhibit 5.

(The document heretofore marked for identification as Staff Exhibit 5 was received in evidence.)

MR. HOEFLING: Mr. Chairman, I request that those exhibits be bound into the record as if read, and I give to the Reporter the appropriate number of copies.

CHAIRMAN MILLER: All right. They'll be included in the transcript.

(The documents follow:)

Resley D. Glenn, Senior Development Engineer, Environmental Evaluations Section, Occupational and Environmental Safety Department, Battelle Pacific Northwest Laboratory

Education

B.S.	Engineering Technology, Oklahoma State University	1971
M.S.	Environmental Health Sciences, University of Michigan	1972

Experience

Mr. Glenn specializes in Health Physics and has experience in the following areas:

- Radiological Engineering. Mr. Glenn has professional experience in radiological engineering which includes evaluation of potential hazards, safeguards, special requirements for new and unique R&D programs and training of health physics technicians.

- Exposure Evaluation. Mr. Glenn has additional experience as exposure evaluation for the Hanford Project. Duties as exposure evaluation included evaluation of bioassay, invivo and TL dosimeter data in routine and non routine situations to determine occupational radiation exposure received in these situations.

- Environmental Impact. Mr. Glenn assisted in the generation of the Generic Environmental Impact Statement on Management of Commerically Generated Radioactive Wastes. Duties included overseeing the evaluation of doses to various population groups from routine and postulated accidental releases. Additional duties included evaluation of environmental impact associated with trasportation of spent fuel, fuel residues and other radioactive wastes.

Publications

RD Glenn, KR Heid, JR Houston; Assessment of a Cerium-Praseodymium - 144 Inhalation Case; accepted for publication in Health Physics Journal.

RD Glenn, PE Bramson; Hanford Critical Radiation Dosimeter; PNL-2276.

LG Faust, RD Glenn, et al; A Guide to Good Practices at a Plutonium Facility; BNWL-2086.

KR Heid, RD Glenn; Internal Dosimetry Program in a Plutonium Facility, The Plutonium Fuel Cycle, Bal Harbour, Florida, May 1977.

PROFESSIONAL QUALIFICATIONS

C. VERNON HODGE

TRANSPORTATION BRANCH

DIVISION OF FUEL CYCLE AND MATERIAL SAFETY

My name is C. Vernon Hodge. I have been employed by the U. S. Nuclear Regulatory Commission since February 1975. My position is in the Transportation Branch of the Division of Fuel Cycle and Material Safety of the Office of Nuclear Material Safety and Safeguards. My responsibilities and activities include the following endeavors:

Review of environmental statements dealing with transportation of radioactive materials, including:

"Transportation of Radioactive Materials by Air and Other Modes," NUREG-0170 (1977),

"Generic Environmental Statement on Use of Mixed Oxide Fuel in Light Water Reactors (GESMO)," NUREG-0002 (1976), and

"Transport of Radionuclides in Urban Environs: Working Draft Assessment, " SAND 77-1927 (1978);

Writing environmental statements dealing with transportation of radioactive materials, including:

"Calculations of Radiological Consequences from Sabotage of Shipping Casks for Spent Fuel and High Level Waste," NUREG-0194 (1977),

"Environmental Survey of Waste Management in the Light Water Reactor Fuel Cycle," NUREG-0116 (1976);

Testifying before Atomic Safety and Licensing Board panels on contentions dealing with radioactive materials in transportation to and from nuclear power stations;

Serving on study panels dealing with emergency response to radiological accidents, including:

Technical coordinator for an NRC/DOT Study Group report "Review and Assessment of Packaging Requirements (Yellowcake) and Emergency Response to Transportation Accidents," (1978). This study was initiated at the request of Congressman Timothy Wirth of Colorado after a serious spill of yellowcake in transit occurred in Colorado in September 1977. Several recommendations were developed for Federal rulemaking and Federal-State interaction to enhance emergency response capabilities of various parties.

Representative for the Office of Nuclear Materials Safety and Safeguards on the NRC/EPA Task Force on Emergency Planning. This Task Force was convened by the NRC Executive Director for Operations in late 1976 to write guidance for States in the matter of defining the light water reactor accident for which States should plan emergency responses. The Task Force issued a draft report NUREG-0396 in 1978, which is now out for public comment.

Advisory Committee to the International Atomic Energy Agency to consider emergency responses to transportation accidents involving radioactive materials. I was able to contribute considerable data from recent NRC studies and activities to the draft document. A Safety Series document may be produced from this effort in about one year.

Source selection panels for NRC contracts designed to survey the capabilities of State and local government agencies to respond to transportation accidents involving radioactive materials and to develop criteria for evaluating emergency plans for such accidents.

Serving on groups studying other aspects of transportation of radioactive materials, including:

Revision of the NRC/DOT Memorandum of Understanding;

Transportation Working Group of the Interagency Review Group on Management of Nuclear Wastes, convened by the President; and

Research review group to monitor a recently initiated NRC research program to develop quantitative information on sabotage of spent fuel casks.

Prior to employment with the NRC, I was employed by an engineering consulting firm, Holmes and Narver, Inc., Anaheim, California. I was principal investigator for the study "Transportation Accident Risks in the Nuclear Power Industry, 1975-2020," EPA-520/3-75-023 (1975), and reported it to the Fourth International Symposium on Packaging and Transportation of Radioactive Materials, Miami Beach, Florida, in 1974. I also was principal investigator for a companion study on routine exposure from transportation. Other assignments involved a conceptual design of a fuel handling facility in a twin HTGR complex, an environmental statement on cleanup, rehabilitation, and resettlement of the Eniwetok Atoll, and an environmental report for a proposed power plant at Kawaihae, Hawaii.

Prior to my employment with Holmes and Narver, my graduate work involved a post doctoral term in theoretical metallurgy at the School of Engineering and Applied Science, University of California at Los Angeles, and Ph.D. (1972) and M.S. (1969) degrees in physics from the University of Idaho. Publications during this period include:

"On the Elastic Interaction of Tetragonal Precipitates in Cubic Metals," UCLA-ENG-7392;

"Spin-Orbit Interaction in Model Potential Calculation of Lattic Dynamics of Simple Heavy Metals," Ph.D. thesis (1971);

"Current-Induced Reflectivity Effects in a Semiconductor," Phys. Rev. B1, 3347 (1970).

Prior to graduate school I was employed with Idaho Nuclear, Inc., and Phillips Petroleum Co. at the National Reactor Testing Station, Idaho, as a critical facility supervisor and as a reactor engineer. My responsibilities with the critical facility included planning, conducting, and reporting reactivity and flus distribution measurements of mockup assemblies of experiment, fuel, and poison simulation loadings for a test reactor. My responsibilities as a reactor engineer included operating a high power test reactor and associated engineered experiments.

MR. HOEFLING: Mr. Chairman, I'd like to have marked as Staff Exhibit Number 6 a document bearing the caption of this proceeding, and entitled, "Affidavit of C. Vernon Hodge and R. Daniel Glenn," consisting of 8 pages.

CHAIRMAN MILLER: I don't think we have that either; was that attached to the motion for summary disposition?

MR. HOEFLING: Yes.

I have copies.

CHAIRMAN MILLER: You have copies?

(Documents distributed to the Board.)

MR. MC GARRY: Mr. Hoefling, a point of clarification. Is there a Table I attached to the back of that document?

MR. HOEFLING: The document contains a table after page 5.

MR. MC GARRY: It's entitled references 1, 2, 3, 4, --

MR. HOEFLING: Yes, that's the last page. I see that Mr. McGarry has another table attached to the back of his document. That's a stapling error of some sort. It shouldn't be there.

MR. MC GARRY: Thank you.

CHAIRMAN MILLER: Let me inquire of counsel:

We do have a document entitled, NRC Staff Testimony of Carl B. Sawyer and C. Vernon Hodge. Is this to

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be regarded as superseded, or not to be used?

MR. HOEFLING: That document addresses a different subject.

CHAIRMAN MILLER: Are we to keep it, or is it obsolete?

MR. HOEFLING: In the Staff's view, currently the document is obsolete.

CHAIRMAN MILLER: It will not be offered, then, as such?

MR. HOEFLING: Not at this time, no.

CHAIRMAN MILLER: Are we going to have an obsolete day?

MR. HOEFLING: This is the testimony relative to the sabotage issue. We've been through that.

CHAIRMAN MILLER: I just want to know what to keep and what not to keep. We seem to have some prefiled testimony, and we don't have the affidavits that were attached to the motion.

We'll get ourselves organized.

All right. The affidavit of C. Vernon Hodge and R. Daniel Glenn have been marked as Staff Exhibit 6, is that correct?

MR. HOEFLING: Yes, Mr. Chairman.

(The document referred to was marked for identification as Staff Exhibit 6.)

MR. HOEFLING: Mr. Chairman, I have some changes I wish to make to that document.

CHAIRMAN MILLER: Fine.

MR. HOEFLING: The first page, in the title, the word "Affidavit" changes to "Testimony."

CHAIRMAN MILLER: That's page 1?

MR. HOEFLING: YEs. In the title, instead of "Affidavit," it should be "Testimony."

The first paragraph is deleted, consisting of two lines.

The second paragraph, the second word, "affidavit" becomes "testimony."

In the footnote, in the first line, strike the word "both," and in the second line strike the words "and Carolina Action."

At page 2, strike the entire first sentence.

The second sentence, strike the word, "That." Capitalize the word "the". Strike the word "shipments" and insert the following clause: "proposed shipments of 300 fuel assemblies from Oconee to McGuire"

Back at page 2, in order for that sentence to make sense, you must also strike the words, "is true" in the

second sentence, fourth line down.

Page 7, two-thirds of the way down, the statement, "We hereby certify..." everything, including those words below, is deleted.

CHAIRMAN MILLER: All right, those changes will be considered made for the record.

BY MR. HOEFLING:

Q Dr. Hodge, did you prepare this testimony?

A (Witness Hodge) Yes, I did.

Q Do you have any changes you wish to make?

A No, I do not.

Q Mr. Glenn, did you prepare this testimony?

A (Witness Glenn) Yes, I did.

Q Do you have any changes you wish to make?

A Yes, there are.

Q Would you make those for us?

A On page 3, the second paragraph, sixth line down, "the per shipment would be 0.00000009," the 9 should be changed to a 3.

DR. HAND: Does the number of zeros change?

WITNESS GLENN: No, it does not.

The next line down, at the end of that line, the 0.00003, the 3 becomes a 1.

The next line down, the number 0.03 becomes 0.01.

BY MR. HOEFLING:

Q On Table 1, page 5, 3b., under individual dose, which would be the third column, the number 0.00016 becomes 0.00036.

That same row, 3b., under fraction of background dose as a percent, the 0.16 becomes 0.36.

The number directly below that, on 3c.,becomes 3.0.

The number in 3d., directly below that, becomes 0.01.

Under 3d. --

MR. MC GARRY: Wait. I'm confused.

MR. BLUM: Can you tell us what numbers you're changing from?

WITNESS GLENN: 3c., under fraction of background dose, the 0.01 becomes 3.0.

3d.,under fraction of background dose, the 0.00000003 becomes 0.01.

Under situation (assumptions), 3d., the number 4200 becomes 2100.

Those are all the changes that I have.

BY MR. HOEFLING:

Q Gentlemen, is this testimony, as corrected, true and correct?

A (Witness Gl Yes.

wml 11

A (Witness Hodge) (Nodding affirmatively.)

Q Did you make reference to any documents in the preparation of this testimony?

A (Witness Hodge) Yes.

A (Witness Glenn) Yes.

Q Have you reviewed those documents?

A (Witness Hodge) I have reviewed those portions related to the testimony.

Q Mr. Glenn, have you reviewed them?

A I also reviewed those portions of those documents related to the testimony.

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Q Are you satisfied with their reasonableness?

A Yes, I am.

A (Witness Hodge) Yes, I am.

Q Are these documents of the type reasonably relied upon by experts in your field in reaching a decision?

A (Witness Glenn) Yes, they are.

A (Witness Hodge) Yes, they are.

Q Now, Mr. Glenn, I want to direct you to Staff Exhibit number 3.

Are there any corrections you wish to make in that document?

A (Witness Glenn) Yes, there are.

Q Would you make those for us?

A Okay.

CHAIRMAN MILLER: Just a minute, let me be clear now. These changes being made are going to be subject to cross-examination.

MR. HOEFLING: Yes, Mr. Chairman, there's an issue in controversy here --

CHAIRMAN MILLER: It's okay. Go ahead.

WITNESS GLENN: Okay.

On page 31, the third paragraph that ends in the sentence:

"Taking all of these factors into account, some more direct interstate routes would seem to

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mpb2

be the most advisable."

I would like to delete the period and continue that sentence as follows:

"...from the viewpoint of radiological impacts of normal transportation on the public."

MR. BLUM: Would you give me that again?

WITNESS GLENN: "...from the viewpoint of radiological impacts of normal transportation on the public."

On page 32, the third line, the number .16 becomes .36.

Continuing on that line, the number .2 becomes .4.

At the end of that paragraph, the number 48 becomes 110.

In the Appendix, page A-3, the end of the first line and the beginning of the second line, the word "upper-bound" should be deleted.

BY MR. HOEFLING:

Q Does that complete your corrections?

A (Witness Glenn) That completes my corrections.

MR. HOEFLING: Mr. Chairman, the Staff would now like to have marked as NRC Staff Exhibit number 7 a document entitled Errata Sheet Regarding Amendment of Materials License, Duke Power Company, Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station - Unit 1, Docket No. 70-2623,

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mpb3 consisting of two pages.

CHAIRMAN MILLER: It may be marked.

(Whereupon, the document referred to was marked as NRC Staff Exhibit No. 7 for identification.)

BY MR. HOEFLING:

Q Mr. Glenn, do you have a copy of Staff's Exhibit number 7 before you?

A (Witness Glenn) Yes, I do.

MR. HOEFLING: Does the Board have copies of that document?

CHAIRMAN MILLER: No.

(Handing document to the Board.)

BY MR. HOEFLING:

Q On the second page of that document, Mr. Glenn, are there certain corrections to the Environmental Impact Appraisal presented?

A (Witness Glenn) Yes, there are.

Q Now, Mr. Glenn, pointing you to Sections 5.3 of the Environmental Impact Statement, and to Section 6.0 and 6.1, are those sections correct as modified by the errata sheet and the corrections you have just made for the record?

CHAIRMAN MILLER: Now this is an errata sheet which relates to the Safety Evaluation Report, is that

POOR ORIGINAL

mpb4 correct?

MR. HOEFLING: The first page does, Mr. Chairman. The second page relates to the Environmental Impact Appraisal.

CHAIRMAN MILLER: I see.

MR. HOEFLING: This document was served on the Board and parties sometime early this year.

WITNESS GLENN: These corrections are correct.

MR. HOEFLING: Mr. Chairman, the panel is available for questions.

CHAIRMAN MILLER: Very well.

Who wishes to cross-examine?

MR. MC GARRY: Applicant has no questions at this time, Mr. Chairman.

CHAIRMAN MILLER: Mr. Blum, or the State of South Carolina?

MR. BLUM: I have questions of the panel.

CROSS-EXAMINATION

BY MR. BLUM:

Q Gentlemen, --

MR. WILSON: Mr. Chairman, before we proceed, might we get some statement at this point of what the panel is posed for? The last time we had a little confusion. Before we got too far down the road, I'd appreciate that.

CHAIRMAN MILLER: Well, I already asked that question. This panel is prepared to be examined on any

POOR ORIGINAL

mpb5 matters contained in their written direct testimony or the changes, amendations, additions, and errata sheets.

They are substantive witnesses. They are available on the merits. They are not in the same category as the witness, Mr. Sawyer, who was put on for a limited purpose.

MR. HOEFLING: May I place some perspective on this, Mr. Chairman?

CHAIRMAN MILLER: Yes.

MR. HOEFLING: The testimony is directed at CLSG contention number two, parts A and B, which deal with impacts associated with transportation in the normal course and in accidents.

If that's helpful to you, Mr. Wilson?

MR. WILSON: Somewhat.

I'm not sure that the two things I'm hearing are gibing very well, but I'm sure that once we get into this it should gel. I presume as soon as Mr. Blum begins his cross-examination we'll begin to see the -- we'll see where the extent of the expertise lies.

DR. LUEBKE: Mr. Hoefling, contention number 2 is relatively short. I think it's helpful in the transcript if we just have it read in. Then we know what follows belongs to that contention.

MR. HOEFLING: Yes, Dr. Luebke.

I am going to read the contention and parts A and

mpb6 B. We have another piece of testimony to address part C which would follow this panel.

I'll read A and B. The contention reads:

"Transportation of spent nuclear fuel from the Oconee Nuclear Station for storage at the McGuire Nuclear Station will create an unacceptable hazard by significantly increasing the radiation doses to persons in the region near the proposed transportation routes between the two facilities. Specifically:

"(A) There will be an unacceptable incremental burden of radiation dose to persons living in the vicinity of the transportation routes.

"(B) There will be an unacceptable incremental burden of radiation dose to persons traveling over the transportation routes concurrently with spent fuel shipment."

DR. LUEBKE: Thank you.

BY MR. BLUM:

Q Gentlemen, can you -- looking at your revisions to Table 1, page 5 of your testimony--one or the other of you tell me what the source is of the changes in the fraction of background dose column?

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mpb7

A (Witness Glenn) The reason for the change in the fraction of background dose was that the numbers that are listed there would represent the dose to a person from one shipment, and we wanted to include the dose from 300 shipments.

Q All right, sir.

So those are multiplying that by 300?

A Essentially that is correct.

Q Well, 3-B has gone up more than that, is that not true?

A 3-B was an error in my original calculation that I corrected.

Q I see.

Why did you -- Looking at 3-D, the situation assumptions, why did you have the number of cars?

A I do not understand your question.

Q Well, in making your correction you changed from 4200 cars exposed maximum to 2100 cars exposed.

A In developing this table there was a separation distance of approximately 3000 miles between Mr. Hodge and myself which necessitated the use of a telephone. In talking about this over the phone, this error came in.

The 4200 is actually the number of people exposed assuming two people per vehicle. Therefore the number of vehicles is actually 2100.

Q All right.

mpb8 Does that number represent that the truck will be going past 2100 cars per trip, or --

A Per trip.

Q Does that not entail an assumption that there are -- let's see -- it passes about 10 or 15 cars per mile on the 170 mile route?

A I believe the number is 12 cars per mile.

Q In other words, the truck is going north, generally speaking, on the route and there are 12 cars per mile going south on this route? Is that your assumption?

A That was my assumption.

Q Is that grounded in any particular fact that relates to either Greenville or Spartanburg at rush-hour?

A This analysis was done based on some information out of NUREG-0170, page 4-16, Table 4-6. This data is based on Albequerque, New Mexico. It assumes 2800 vehicles per hour in a high population area.

It assumes fraction of travel distance of five percent. Another fraction used is that 92 percent of that five percent is non-rush-hour traffic, and eight percent is rush-hour traffic. Rush-hour traffic includes a factor of two for the increase in traffic density. It includes going on under medium population areas, five percent of the travel would be in medium population areas. The density is 780 vehicles per hour. And then low population areas,

405 127
POOR ORIGINAL

mpb9 90 percent with a one-way traffic count of 470 vehicles per hour.

These vehicles relate under a high population area as non-rush-hour traffic, 67,200 vehicles per day, under medium population areas, 18,720 vehicles per day, and low population areas 11,280 vehicles per day.

We have also gone out and done some spot checks in the Charlotte area. First-hand knowledge indicates that on a given Friday evening we took one count, or several counts in various areas, but only on one particular day, that we got a count of around 16- to 1700 vehicles per hour at that time. That was a 15 till 6:00 on Friday evening.

Q Do you know whether that represents -- strike that.

Do you know how that quarter to six time relates to the rush-hour in Charlotte on any given Friday?

A I do not. I did not specify whether it did or did not at the time we took the account.

Q Do you know what day that was?

A That was this last Friday. I kind of lost track of the days; I don't know the exact date of the month. But it was the last Friday.

Q Well, how does that relate to Interstate 85, though, as it passes through Charlotte?

A That was on Interstate 85.

mph10

Q Did you take into account in making that calculation the fact that the Independent Truckers are on strike?

A I did not, but I saw several trucks. It wasn't as if there were no trucks on the road.

Q Did you do any traffic studies for Interstate 85 as it goes through the other cities along the way?

A Mr. Hodge?

A (Witness Hodge) Late in the month of May we traveled the route described in the Environmental Impact Appraisal that the spent fuel shipment would take up to the point not far past the intersection of I-85 and I-77 in Charlotte. And we counted the cars passing us in Greenville, used a relative estimate calculation to determine the number of vehicles on the road at that time, and derived 1100 vehicles per hour.

Q How does 1100 vehicles per hour, or 1600 vehicles per hour translate into the number of cars you might expect to be exposed?

A (Witness Glenn) What it shows is that in the areas of high population densities that our assumption of 2800 vehicles per hour was a reasonable assumption, that in fact it is probably a little bit high.

Q What is the total length of this trip that is taken by a heavily laden truck in hours?

A NUREG-0170 assumes that the truck travels at the

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mpb11 normal rate of traffic, which would be at the flow rate the traffic is going at the time.

Q So that it would be somewhat over three hours for the total trip?

A If you traveled at 50 miles an hour, you're going to take three and a half, four hours to make the trip.

Q If you calculate 1100 vehicles per hour going through Greenville at some unspecified time, wouldn't that give you something on the order of 3800 cars as opposed to 2100 cars?

A Excuse me, would you repeat the question?

Q If you have a figure of 1100 cars per hour in Greenville -- or vehicles per hour, I suppose, in Greenville, and the total trip is three and a half hours, wouldn't you pass about 3800 vehicles?

A Greenville represents a very small stretch of this route. Most of this route is through rural areas.

If you used that number for the entire route that would increase the number proportionally by a factor of two over what we've estimated, what I've estimated.

Q Basically you're dealing with a very heavily traveled truck route, I-85, isn't that true?

A Yes.

I might interject that the NUREG-0170 uses Interstate 40 throughout New Mexico, which is also a very

mpb12 heavily traveled highway.

Q But you're saying you can't give me an average number of vehicles on I-85 over the length that this particular truck will be at .g.

A No, I cannot.

Q What is the error range that you would expect in that 2100 figure?

A Over a large number of shipments, I would not expect that number to be in error by more than 25 percent. On any given shipment it could be in error by more than that.

Q Looking at 3-C and 3-D on your chart, in 3-D you have an individual group dose of .04 and 3-C has .08.

Now I'm slightly puzzled by that because the .04, those people are the width of the median away, perhaps -- whatever that is -- ten meters. Why is that? Why are those two figures so close when the .08 people, the 3-C people, the same-way traffic have a much greater potential of being closer to the truck?

A The 3-C number assumes that the truck and the vehicles on the roadway with it are traveling at the same rate of speed and that they are uniformly distributed on the roadway. The dose was calculated, and in my previous question it figures out to 12 vehicles per mile at 620 vehicles per hour.

POOR ORIGINAL

So we have two persons per vehicle, 24 vehicles

mpb13 -- excuse me -- 12 vehicles, for a total of 24 people who are on the roadway traveling at the same speed as the truck and are assumed to be there for four hours.

The opposite flow, true the vehicles are further apart, and they are also traveling in opposite directions at, in this case, 50 miles an hour was used. But you have a much larger number of people who are exposed. They do tend to balance out.

Q Well, what distance did you assume your 12 cars were at?

A I assumed that the closest car was at 100 feet and the furthest car was 2600 feet.

Q Wouldn't your assumptions of doses change if you postulate the truck traveling at, let's say, 50 miles an hour, being passed by a steady stream of traffic, 1100 cars per hour going passed it at 55 or 60, and therefore coming within one or two meters of the truck for a short period of time?

A Yes, for a short period of time they would be beside the truck. But they would not be there for the four hour period that this calculation assumes. Their exposure period would be much less. They would pass the shipment, continue on by, and get out of the area of exposure. And the analysis we have here assumes they stayed there for the four hour period.

Q That would give you people passing steadily, but

mpb14 the cumulative dose to that entire population in the passing cars would be a lot greater, would it not?

A In my opinion it would not be a lot greater.

Q Well, we'd better define "a lot".

How much greater do you think it would be?

CHAIRMAN MILLER: Than what? What are we comparing?

MR. BLUM: Than what he's got down here.

WITNESS GLENN: It's my opinion that I don't think it would be greater.

BY MR. BLUM:

Q Why not?

A (Witness Glenn) Because the exposure times are much less. The exposure in this case is -- the exposure rate is a function of distance from the vehicle and the time you spend by the vehicle. You pass the vehicle, you run a higher exposure rate for a short period of time; but then you proceed out of that and are gone.

Q That's for each passing individual.

I'm concerned with the situation in which you have essentially a steady stream of cars, 1100 per hour or 1600 per hour, some figure like that, steadily passing the truck, drawing to within a meter or two of the cask, and then pulling on by.

A I'll answer your question this way:

If you assume 1100 or 1600 vehicles, it will be

POOR ORIGINAL

mpb15 greater than the number that I have because that is a greater number than I used.

I used 620 per hour.

Q Doesn't the steady stream of cars passing the truck approach the traffic jam situation in terms of your consideration over the total population doses?

A No, because there is a significant separation distance between each car. If you figure -- when you stop and figure out cars going as fast as they are, there is a significant separation distance. The traffic jam assumes that all the cars are bumper to bumper.

(Pause.)

Q In doing 3-C, did you assume that both the 12 cars and the truck, everybody was traveling at 55 or 50 or the same speed?

A That is correct, the same speed.

Q They were just distributed over these varying distances, 100 feet to 2600 feet?

A That is correct.

Q You didn't consider the situation in which the car was traveling at a steady 55 or so miles an hour and a truck was traveling at, let's say, 65 downhill and 50 uphill, and they play leap-frog for half an hour, an hour at a time?

A I did not.

Q Why did you eliminate that possibility?

mpb16

A I did not think it was relevant.

Q It has the potential for giving you higher dosages for the individuals in that particular car, does it not?

A I'm sure that I could postulate a dose that would be higher given some set of circumstances that you would dream up. However my question would be back to you, How long is this going to continue? Is this going to be a couple of times, just on a short hill and then they're going to separate again? Then I would say no.

If they're going to do this for four hours, then I'd say -- and they stay close together -- it could be slightly higher. I don't think there's going to be a significant difference, though.

Q All right.

It is true that the distance function, when dealing with distance we're dealing with an inverse square proposition, so that the closer the truck is to a car, the greater the dose builds up, by the square of the amount the distance is cut.

A That is true.

Q The time function in this as relates to dosage would be linear, is that true?

A That is true.

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Q All right.

MR. BLUM: If I may have just -- I don't think I

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mpb17 have anything more of them on this particular portion of the testimony, but if I may have a minute?

CHAIRMAN MILLER: Fine.

(Pause.)

BY MR. BLUM:

Q What have you assumed -- I see. It's also on page 5, Table 1.

You've assumed the closest exposed individual is 30 meters from the road, is that true?

A (Witness Glenn) That is correct.

Q How was that figure of 30 meters determined?

A I traveled the route and observed the orientations of buildings along the route, and from that I determined that if I used the models contained in NUREG-0170, which assumed that the population is evenly distributed from 100 feet to 2600 feet either side of the roadway, that that analysis would be a valid analysis.

Q That would be 2-B, where you got your 4200 people distributed.

A Right.

Q I'm interested in the closest person -- excuse me.

A This number from that population is the dose that the individual postulated to be closest would have.

Q It's my impression that there are motels at least closer to the roadway than 30 meters.

mpb18

Did you verify whether that was true?

A I do not remember seeing any motels closer than 30 meters to the roadway. Even if there were, these type of facilities are usually populated at night. These shipments are not allowed at night.

Q Well, I'm concerned about the dosages, since we're dealing with 300 shipments, to people who might be working in motels, working in restaurants, that might be close to the interstate, or working in, for instance, some of the manufacturing establishments in Spartanburg who might be there for all 300 shipments.

Did you determine the distances of any buildings of that sort from the roadway?

A I did not actually measure distances. But as I stated previously, I do not remember any being closer than 30 meters.

(Pause.)

Q Now what is your basis of the limitation of the shipments to daytime?

A It's my understanding that the new regs that are coming out does not allow shipment at night. And I have no basis for that, I guess.

Q That's in the sabotage regulations?

A Right.

Q Okay.

Thank you, gentlemen.

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CHAIRMAN MILLER: Any other examination?

(No response.)

Very well, you may be excused. Thank you.--

I'm sorry, Dr. Luebke has a question.

EXAMINATION BY THE BOARD

BY DR. LUEBKE:

Q Are you including in this conversation the errata sheet?

MR. HOEFLING: Yes, Dr. Luebke.

BY DR. LUEBKE:

Q Then I'm referring to page 2 of the errata sheet, Staff Exhibit 7, which is a change in the Environmental Impact Appraisal. It says,at page 30,-- I guess my question is:

Does this change infer that there is no longer any specification on the surface dose rate on the package?

In other words, I read the top sentence, which is apparently the original sentence, and it gives a number of 200 millirem per hour at any external surface, and 10 millirem per hour at two meters from the external surface.

And down below, it omits the 200 millirem at the surface and leaves the 10 millirem at two meters.

Is the meaning of that that the regulation has been changed?

A (Witness Hodge) The regulations have not been changed.

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Q Well, I'm concerned about it, and voice this concern because, while I cannot cite the exact reference, I understand there have been incidents where shipping casks have been received at destinations with hot spots, these hot spots having been caused by the fact that they are loaded in contaminated water and then, as the story goes, they haven't been rinsed off completely and then they arrive at the destination, they find the hot spots result from latent radioactive contamination in nooks and crannies.

And I would like to be sure that this specification of dose rate at the surface is intact and applies here.

A I assure you that it is.

Q Then I guess I don't understand the reason for the correction.

A (Witness Glenn) The reason for this correction is that the previous line says "the external surface of the package," and that should have read "from the vertical plane projected from the outer edges of the vehicle."

That was the reason, essentially the reason for the change, to indicate from the edge of the vehicle and not the edge of the cask.

Q And what does that have to do with the specifications of certain dose rates?

A I misunderstood your question.

Q Well, I'm concerned about the fact that as I read

eb3 the change that's being made here, you eliminate the specification on the surface dose rate, and it just puzzles me.

A (Witness Hodge) That omission appears to be an error. The 200 millirem per hour phrase should not be changed.

Q In other words the errata needs an errata?

A Yes.

Q So how do we correct the record, the mechanics of it?

MR. HOEFLING: Mr. Chairman, we have the Department of Transportation regulations here. We're trying to get the appropriate one that applies.

(Pause.)

Mr. Chairman, this is a question of the application of DOT regulations to these shipments, and what I would propose to do is to check on that point and inform the Board at a later time and if necessary, reflect a change in the errata sheet, if that happens to be the case.

But it is really a case of the application of DOT regulations at this point. We have an element of uncertainty on that particular point.

CHAIRMAN MILLER: What about the SER now? It looks like you might have a similar uncertainty. I'm not positive but you may want to check it.

MR. HOEFLING: I think the errata sheet went to both documents on the same point, and whatever we determine

eb4 would go to both documents.

CHAIRMAN MILLER: Then we'll consider there's an error in the two documents, the SER and the Environmental Impact Appraisal, the designated portions, the nature of which is not entirely clear and the record may remain open briefly for the purpose of whatever corrections or explanations may be required.

DR. LUEBKE: I think I would like to go a little further and say that if you do find from the DOT that the surface specifications have been eliminated, then I still voice the concern about the problem that has occurred, probably more than once, and we need to contend with it somehow as a possible condition in the decision-making.

MR. MC GARRY: Mr. Chairman, I have one question for this panel.

CHAIRMAN MILLER: Very well.

CROSS-EXAMINATION (Resumed)

BY MR. MC GARRY:

Q Gentlemen, I forget which one of you made the statement but you indicated shipments would not be permitted at night. Do you know that as a fact?

A (Witness Glenn) I do not.

Q Do you, sir?

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A (Witness Hodge) I don't recall that that is a relative position of the new regulation, and if it is

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dependent upon NRC approval, I do not know its effect.

Q Thank you.

One further question:

Assuming that the material can be transported in the evening, would the fact that people would be in motels in the evening as the material is transported past the motels materially change your testimony?

A (Witness Glenn) It would not.

Q And you, sir?

A (Witness Hodge) No, sir.

MR. MC GARRY: No further questions.

CHAIRMAN MILLER: Anything further, Mr. Blum?

BY MR. BLUM:

Q Doesn't the possibility that motels along the Interstate might be filled at night and not filled during the day mean a fairly significant movement of people closer to the Interstate?

A (Witness Glenn) Not significant. I wouldn't consider it significant.

MR. BLUM: Thank you.

CHAIRMAN WMILLER: Any further questions?

(No response.)

The panel may be excused.

MR. HOEFLING: Mr. Chairman, I would like to move Staff Exhibit Number 6 into evidence at this point, which is

ab5 the testimony that these gentlemen sponsored.

CHAIRMAN MILLER: Any objection?

MR. MC GARRY: No objection, Mr. Chairman.

MR. BLUM: May I have a moment, please?

(Pause.)

Well, it all goes to the weight.

No objection.

CHAIRMAN MILLER: Very well. It may be received in evidence.

(Whereupon, Staff 6, having been previously marked for identification, was received in evidence.)

MR. HOEFLING: Mr. Chairman, I would like these gentlemen to stay in their places for the purposes of the next presentation.

CHAIRMAN MILLER: All right.

MR. HOEFLING: And there's a gentleman I want to add to the panel.

CHAIRMAN MILLER: Very well.

MR. HOEFLING: The Staff calls Mr. Jerry Jackson to the stand.

Whereupon,

JERRY E. JACKSON

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was called as a witness on behalf of the NRC Regulatory Staff

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and, having been first duly sworn, was examined and testified as follows; and

Whereupon,

C. VERNON HODGE

and

RESLEY D. GLENN

resumed the stand on behalf of the NRC Regulatory Staff and, having been previously duly sworn, were examined and testified further as follows:

MR. HOEFLING: Mr. Chairman, with regard to Staff Exhibit Number 6, I would like to have that exhibit bound into the record as if read. And I will now give to the Reporter the appropriate number of copies. This is the exhibit you just ruled on.

CHAIRMAN MILLER: Yes. That may be in incorporated into the transcript.

(The document follows:)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY	)	Docket No. 70-2623
	)	
(Amendment to Materials License	)	
SNM-1773 for Oconee Nuclear Station	)	
Spent Fuel Transportation and Storage	)	
at McGuire Nuclear Station)	)	

AFFIDAVIT OF C. VERNON HODGE AND R. DANIEL GLENN

Introduction

Our names are C. Vernon Hodge and R. Daniel Glenn. Copies of our professional qualifications are attached.

This affidavit addresses a contention which reads as follows.*/

> Transportation of spent nuclear fuel from the Oconee Nuclear Station for storage at the McGuire Nuclear Station will create an unacceptable hazard by significantly increasing the radiation doses to persons in the region near the proposed transportation routes between the two facilities. Specifically:
>
> (a) There will be an unacceptable incremental burden of radiation dose to persons living in the vicinity of the transportation routes.
>
> (b) There will be an unacceptable incremental burden of radiation dose to persons traveling over the transportation routes concurrently with spent fuel shipment.

*/ This contention is raised by both Carolina Environmental Study Group and Carolina Action as Contention 2 of "Stipulations" dated October 18, 1978. Only Parts (a) and (b) are addressed in this testimony. Part (c) is addressed elsewhere by the NRC Staff.

Discussion

These contentions claim that the exposure to the population living near the routes of the proposed shipments and traveling on those routes is unacceptable. That the shipments would produce an incremental radiation dose is true, but the expected magnitude of the dose is very small and is acceptable.

Estimates of routine exposure various groups due to shipment motion and stops, including inadvertent stops such as traffic jams, are given in Section 5.3 of "Environmental Impact Appraisal Related to Spent Fuel Storage of Oconee Spent Fuel at McGuire Nuclear Station - Unit 1 Spent Fuel Pool" (EIA). Additional estimates are available from recent calculations. All the estimates are summarized in Table 1 below. That Table also presents data to clarify the significance of these dose estimates. A comparison of the dose related to the spent fuel shipments (assumed to be received in one year) to annual dose received from background radiation is presented and estimates of health effects of the dose are discussed.

The radiation dose to persons living in the vicinity of the transportation route was calculated in accordance with data presented in "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," WASH 1238[1]. Additional analysis based on "The Transportation of Radioactive Material by Air and Other Modes," NUREG 0170[2], corroborated the analysis based on WASH 1238. This

additional analysis indicates that the average dose to a person along the route would be about 0.000003 rem per year with a maximum dose to any individual of about 0.00002 rem per year under normal conditions, or about 0.02 percent of the dose received annually from background radiation.

Transportation doses to persons traveling on the route concurrently with the spent fuel shipment were calculated based on NUREG 0170, Appendix D. For travel in the direction opposite to that of the shipments, the cumulative population dose for the assumed 300 shipments in one year was calculated to be about 0.04 person-rem. The average dose to an individual per shipment would be 0.00000009 rem. The dose to a hypothetical individual who passes each of the 300 shipments would be about 0.00003 rem. This dose represents about 0.03 percent of the background dose received by such an individual during one year.

The cumulative dose to persons traveling in the same direction and at the same speed as the shipment was calculated to be about 0.08 person-rem. The average individual dose was calculated to be about 0.00001 rem per shipment and about 0.003 rem if the same individual traveled concurrently with all 300 shipments. This dose represents about three percent of the background dose received by an individual in one year.

The dose to the public from a delay in transit (in this case a traffic jam in a high density population area) would result in a population dose of about 0.01 person-rem per hour of delay plus about 0.005 rem/person/

hour for persons parked in vehicles along side the cask during the delay. Assuming two persons per vehicle and four cars beside the cask at an average distance of 3 meters from the truck for three hours, the population dose would be about 0.2 person-rem and the maximum individual dose would be about 0.015 rem.

As shown in Table I, the dose estimates (assumed to be received in one year) from the described hypothetical exposures are significantly smaller than the dose commitment from background radiation in one year. The basis used for these comparisons is 0.1 rem per year for each individual. The background dose has been estimated higher, but this number is used for conservatism, that is, to obtain the highest value of the ratio of estimated annual dose commitment due to the proposed spent fuel shipments to the annual dose from background radiation. The variability of life style contributes greatly to the variation in background dose. For example, living in a concrete house rather than a wooden one, taking an occasional commercial air trip, eating different foods, and using different consumer products could add doses to individuals ranging from 0.001 to 0.01 rem per year. Medical and dental radiation exposure would be expected to add about 0.01 to 0.1 rem per year[3]. Further explanation of the contributing factors in estimation of background dose are given in Table II.

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Table I. Estimates of Individual and Population Doses from Routine Exposure to Proposed Spent Fuel Shipments[a]

Population Group	Situation (Assumptions)	Individual Dose (rem)[b]	Individual Group Dose (person-rem)[b]	Fraction of Background Dose (percent)	Health Effect
1. Public at truck stops	1. A person standing 1m (3 ft) from cask for 3 min; not normally expected	1. 0.0013	---	1. 1.3	The numbers of health effects are too small to estimate. For example, the BEIR Report[c] estimates 50-165 latent cancer fatalities per one million person-rem during the first 25-27 years after irradiation. In NUREG-0170[d], estimates of 120 latent cancer fatalities per million person-rem and 170 genetic effects per million person-rem were used. Thus the annual background population dose estimated for the population exposed in Item 2b, which is 4200 person-rem, would result in less than one latent cancer fatality per year and less than one genetic effect per year.
2. Public living near the Oconee-McGuire route	2a. 300 shipments passing most exposed individual 30m (100 ft)	2a. 0.00002	---	2a. 0.02	
	2b. 300 shipments passing 42,000 people living near route	---	2b. 0.1	2b. 0.0024	
3. People traveling on route with truck	3a. Traffic jam, 10^4 people/mi^2, for 3 hours	---	3a. <0.2	3a. 0.02 assuming negligible dose outside 1 mi^2	
	3b. Car following truck at 30m (100 ft) for 4 hours	3b. 0.00016, per occupant	---	3b. 0.16	
	3c. Same way traffic 12 cars exposed max, 2 occupants/car, 300 shipments	---	3c. 0.08	3c. 0.01	
	3d. Opposite traffic, 4200 cars exposed max, 2 occupants/car, 300 shipments	---	3d. 0.04	3d. 0.0000003	

[a] Assuming 300 shipments in one year.

[b] For comparison with dose received from annual background radiation, the estimated dose is assumed to be received in one year. The individual dose from annual background radiation is taken to be 0.1 rem.

[c] See Reference 4.

[d] See Reference 2.

Table II. Composition of Background Dose Estimates for Individuals

Source	Dose to Whole Body (rem)
United States average from naturally occurring sources, per year*	
Cosmic	0.045
Terrestrial	.060
Internal	.025
Total	0.130
North Carolina average from naturally occurring sources, per year	
Total	0.145

*Source: Klement, A. W., Jr., Miller, C. P., Minx, R. P., and Shleien, B., Estimates of Ionizing Radiation Doses in the United States: 1960-2000 ORP/CSD 72-1. U. S. Environmental Protection Agency, Office of Radiation Programs, Washington, D. C. (August 1972).

See also Reference 3.

Of most value for understanding the impact of radiation on human beings is the cumulative population dose estimate. On a well documented statistical basis[4], a million person-rem of population dose is estimated to result in about 50-165 latent cancer fatalities. The population dose estimates in Table I are orders of magnitude smaller than this estimate. Even if the maximum annual doses estimated for the hypothetical situations described in Table I were to be realized, they would not produce readily discernible health effects.

Conclusion

We conclude that the routine exposure from these proposed shipments would not be unacceptably large. Since the proposed shipments will not cause a significant increase in radiation dose to persons near them, they will not pose an unacceptable hazard.

We hereby certify that the above statements are true and correct to the best of our knowledge and belief.

C. Vernon Hodge

C. Vernon Hodge

R. Daniel Glenn

Subscribed and sworn to before me this 10TH day of MAY, 1979.

Nadine C. Sides

Notary Public

My Commission Expires: July 1, 1982.

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REFERENCES

1. "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," WASH-1238, U. S. Atomic Energy Commission, Directorate of Regulatory Standards (December 1972).

2. "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes," NUREG-0170, U. S. Nuclear Regulatory Commission, Office of Standards Development (December 1977).

3. "Radiological Quality of the Environment," EPA 520/1-77-009, U. S. Environmental Protection Agency, Office of Radiation Programs (September 1977).

4. "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation (BEIR)," National Academy of Sciences - National Research Council (November 1972), p.91.

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MR. HOEFLING: Mr. Chairman, I would like to have marked for identification as NRC Staff Exhibit Number 8 a document entitled "Professional Qualifications - Jerry E. Jackson," consisting of two pages.

CHAIRMAN MILLER: It may be marked.

(Whereupon, the document referred to was marked as Staff Exhibit 8 for identification.)

DR. HAND: Wasn't your errata sheet Number 8, Mr. Hoefling?

MR. HOEFLING: I hope not. Let me check.

CHAIRMAN MILLER: The errata sheet is 7.

DR. HAND: All right.

DIRECT EXAMINATION

BY MR. HOEFLING:

Q Do you have a copy of NRC Staff Exhibit Number 8 before you?

A (Witness Jackson) I do.

Q Did you prepare that?

A I did.

Q Is it correct?

A Yes, it is.

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CHAIRMAN MILLER: We don't seem to have 8.

MR. HOEFLING: Mr. Chairman, at this time the Staff

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ab2 would move Mr. Jackson's qualifications into evidence.

CHAIRMAN MILLER: Any request for voir dire examination?

MR. BLUM: No, sir.

MR. MC GARRY: No, sir.

CHAIRMAN MILLER: Staff Exhibit 8 will be admitted into evidence.

(Whereupon, Staff 8, having been previously marked for identification was received in evidence.

MR. HOEFLING: I would like it bound into the transcript, and I will give the Reporter the appropriate number of copies.

CHAIRMAN MILLER: It may be, assuming that the testimony is. Assuming that the testimony is admitted, it may be bound into the record.

MR. HOEFLING: Mr. Chairman, I would like to have marked as NRC Staff Exhibit Number 9 a document bearing the caption of this proceeding entitled "Affidavit of C. Vernon Hodge, William H. Lake, Jr. and R. Daniel Glenn," consisting of 15 pages.

CHAIRMAN MILLER: It may be so marked. And I don't believe the Board has copies.

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(Thereupon, the document referred to was marked as Staff Exhibit 9 for identification.)

MR. HOEFLING: I would like to make some changes to that document, to Staff Exhibit Number 9.

In the title, the word "Affidavit" goes to "Testimony."

The name "William H. Lake, Jr." is deleted. The name "R. Daniel Glenn" is deleted, and replaced by the name of "Jerry E. Jackson."

The first paragraph consisting of two lines is deleted.

MR. BLUM: Did you just delete R. Daniel Glenn?

MR. HOEFLING: Yes. He's up there. He's a supporting witness, not sponsoring the testimony.

MR. BLUM: All right.

MR. HOEFLING: In the second paragraph, the second word, "affidavit" goes to "testimony."

In the first footnote, strike the word "both" in the first line and strike the words "and Carolina Action" in the second line.

At page 12, strike the middle paragraph consisting of one sentence beginning with "In summary,...."

Finally, at page 14, strike everything below the

word "small."

And the certification is to be stricken.

BY MR. HOEFLING:

Q Dr. Hodge, did you prepare this testimony?

A (Witness Hodge) Yes, I did.

Q Do you wish to make any changes?

A No, I do not.

Q Mr. Jackson, did you prepare this testimony?

A I did not.

Q Do you adopt this testimony?

A I do.

Q Dr. Hodge and Mr. Jackson, is this testimony as modified true and correct?

A (Witness Hodge) Yes, it is correct.

A (Witness Jackson) Yes, it is correct.

Q I wish to ask you some questions now.

Did you make reference to any documents in the preparation of this testimony?

A (Witness Hodge) Yes.

A (Witness Jackson) Yes.

Q Have you reviewed those documents?

A (Witness Hodge) We have reviewed those portions of the documents relating to this testimony.

Q Mr. Jackson, you also?

A (Witness Jackson) I've reviewed portions related

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to the heat transfer and the thermal areas of this testimony.

Q Are you satisfied with the reasonableness of those documents?

A I am.

A (Witness Hodge) Yes.

Q Are these documents of a type reasonably relied upon by experts in your field in reaching a decision?

A Yes.

A (Witness Jackson) Yes.

MR. HOEFLING: Mr. Chairman, Mr. Glenn is not a sponsor of this testimony but he did support portions of the testimony with calculations and I think it would facilitate cross-examination if he remained with the panel to answer questions.

CHAIRMAN MILLER: Yes, we will give him leave for that purpose.

MR. HOEFLING: The panel is available for questions.

CHAIRMAN MILLER: Mr. Blum, are you ready to proceed? I'm going to give you a recess if you would rather have it now.

MR. BLUM: Yes.

CHAIRMAN MILLER: Let's take our recess.

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(Recess.)

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CHAIRMAN MILLER: Are we ready?

MR. HOEFLING: Mr. Chairman, it has been brought to my attention by Mr. Jackson at the break that there's one addition to the testimony on page nine he would like to make.

CHAIRMAN MILLER: All right.

WITNESS JACKSON: It's in the way of a very minor typographical error, but about toward the end of the first paragraph there in parentheses is written:

"Uranium dioxide melting temperature exceeds 4500 degrees."

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It should be degrees F for Fahrenheit.

CHAIRMAN MILLER: Thank you.

Anything else?

WITNESS JACKSON: That's all.

CHAIRMAN MILLER: Very well, you may cross-examine.

MR. BLUM: Yes, sir.

CROSS-EXAMINATION

BY MR. MBLUM:

Q Gentlemen, were you here when I believe it was Mr. Carlson testified, were any of you here?

A (Witness Jackson) Yes, I was.

A (Witness Hodge) Yes.

Q Do you agree with his conclusion that if the cask, the tractor-trailer -- Let me start over -- that if the cask

were to overturn and be subject to heat, there's a chance of a loss of internal cavity coolant that would -- that could reach 100 percent?

A (Witness Jackson) To release the coolant from the cavity, you would have to exceed the burst disc pressure, the design pressure which is approximately 1100 psig.

This particular cask has demonstrated -- or in the Safety Evaluation Report it has been shown that the internal design pressure would not exceed this value as applied to the accident conditions of 10 CFR 71.

Q Well can you answer the question I asked now?

A What was his conclusion?

I'm sorry, would you restate the question so that I could know what his conclusion was? I'm not sure that I remember in exact detail what his conclusion was.

Q As I remember his conclusion it was that if you had an accident in which there were a fire condition sufficient to raise the pressure internally to 1100 degrees -- excuse me, to 1100 pounds per square inch and the cask had overturned, that 100 percent of the coolant liquid would then leave the cask cavity.

A I don't know that I can agree entirely with his conclusion that 100 percent [illegible] coolant would be lost. I think you would have to investigate that further. Certainly if the pressure exceeded 1100 psig., your path would be open

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for coolant loss.

Q If you look at page 35 of the Environmental Impact Appraisal, Staff Exhibit Number Three, Section 6.1.3, on line four you have a number of 0.1 percent of loss of the cavity coolant.

A (Witness Glenn) That's my number.

Q Whose number?

A My number.

Q Fine.

What basis did you use for making that assumption?

A That number assumes that the cask is subjected to a fire of 30 minutes' duration and a temperature of 1475 degrees, that the relief of pressure would result in that type of a scenario, that the steam vapor released would be equivalent to 0.1 percent of the cavity coolant.

Q All right.

But isn't it true that once -- if it were overturned and that happened, the scenario that you've just described happened, that approximately 100 percent of the coolant would come out?

A More than 0.1 percent would come out. It would be a reasonable thing to assume in that case. 100 percent, the only way 100 percent would come out is if the 200 psi pressure relief valve also failed to close.

Q If you had a continuing fire --

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A Excuse me, this is a 30-minute fire.

Q All right.

A (Witness Jackson) That paragraph addresses a fire longer than 30 minutes, I believe.

Q Yeah, that's what it says. That is true, isn't it, the second -- the last, the end of the second line of that paragraph it says: "associated fire that lasts longer than 30 minutes."

A (Witness Glenn) The fire in the analysis was assumed to last 30 minutes.

Q Is that sentence then in error?

A Would you point me to that, please?

Q The first sentence in that paragraph reads, well, in part, "the cask is involved in an overturn accident and associated fire that lasts longer than 30 minutes."

A For the analysis that it refers to, the deletion of the word "longer" would probably make it correct.

Q You worked with a fire of 30 minutes?

A That's correct.

I might point out at this point that if you do assume a more significant fraction of the coolant is released, any given percentage that you want to pick from 0.1 percent to 100 percent, that is still going to be less than the accident that is presented in Section 6.1.4. And these accidents are designed to give a basis for one to make a

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decision of what magnitude of accidents one might expect from various categories of transportation accidents and give people an opportunity to find out what those impacts might be from the severe accident that people talk about.

Q All right.

Now I notice you've gotten to what I'm interested in in part, you give the probability of 6.1.4 extra severe collision or overturn accident as happening as 4.2×10^{-8}. What is the probability of the less severe accident you've considered in 6.1.3?

A First of all, if there was 100 percent loss of the coolant, I would not consider this the moderate accident that it now is.

Q This is a moderate accident? I mean, cask overpressurization is considered a moderate accident probability?

A It would be considered severe, excuse me, moderate to severe, in that range.

Q Well what is the -- are you saying the probability is 3×10^{-7} or -- is that the probability of this accident occurring?

A The accident as postulated, yes.

Q Okay.

Well, as I understand the testimony that has already been received, if the cask turns over and the fire

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1 triggers the burst disc pressure release, then there is
2 essentially nothing that would stop the flow of the cavity
3 coolant until the lower range valve triggers, the 200 pound
4 psi valve triggers it.
5 A WASH-1238 states that about five percent of the
6 contained vapor would be released. It's my opinion that
7 if the cask was turned over such that water would come out,
8 I would expect something on the order of five percent to
9 come out before that valve operated.
10 Q I don't understand how that can be if the cask --
11 if you have a fire in the vicinity and the cask is also,
12 the spent fuel element is producing heat, why that wouldn't
13 operate as a teakettle and boil off all its contents over a
14 period of time which wouldn't be very long.
15 A The chances are that a fire as described here of
16 30 minutes duration, 1475 degrees, would not result in
17 enough pressure to even operate the relief valve.
18 Q Well you've assumed that it does.
19 A Okay I've assumed that it does, right.
20 Q But the point is that once that relief valve is
21 operated, then the contents are going to continue to come out.
22 A (Witness Jackson) One of the mechanisms that
23 could slow it up, I couldn't attest to the fact 100 percent
24 couldn't be lost, but the valve downstream reseats at 200 psig.
25 So if coolant or gas is lost, then this gets to reduce the

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1 internal pressure of the cask.

2 Also there's a flow rate problem through this

3 line. You wouldn't expect to lose all the coolant in only

4 a fraction of a second, so you could have a possibility of a

5 valve opening and reseating.

6 If it were turned over, it could be impeded in

7 some way, so there are mechanisms, it's not clear-cut that

8 you couldn't lose 100 percent of the fluid.

9 MR. BLUM: If I may have a second.

10 (Pause.)

11 BY MR. BLUM:

12 Q Do you know the temperature inside the cavity

13 when the burst disc pressure lets go, the temperature associated

14 with 1100 psi?

15 A (Witness Glenn) I do not.

16 Q And I assume, therefore, that you also do not

17 know the vapor pressure of the water in the cavity at that

18 point?

19 A I do not.

20 Q Wouldn't those be the factors that would really

21 govern the pressure inside the cask and therefore the rate

22 at which water would come out? It would be steam, perhaps.

23 A That seems logical, yes.

24 A (Witness Jackson) That wouldn't be a closed

25 system with loss of cooling or vapor. This goes to relief

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of pressure internally to the cask. It could contribute to the internal relief of pressure.

Q Under the circumstances that have been described, then, none of you gentlemen can really tell me what percentage of the cavity coolant contents will be released?

I take it, Mr. Jackson, that's what you're saying?

CHAIRMAN MILLER: Is that correct, Mr. Jackson?

WITNESS JACKSON: I did no calculations in relation to that number.

BY MR. BLUM:

Q But you testified that at some indeterminate figure up to -- close to, potentially close to 100 percent?

A (Witness Glenn) One thing to remember --

CHAIRMAN MILLER: Who are you asking the question of?

MR. BLUM: Mr. Jackson.

CHAIRMAN MILLER: Mr. Jackson, is that correct, you had previously testified that there would be loss of coolant approaching 100 percent?

WITNESS JACKSON: I said there were other mechanisms that could impede the loss of coolant, and you would have to define a scenario to look at in detail to determine if there would be a loss. It could be possible for a loss that great.

BY MR. BLUM:

Q You might get a mud plug or something that would

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block the flow from that particular release valve?

A (Witness Jackson) This is for the accident, I would like to make that clear, of severity great enough to cause the internal pressure to exceed 1100 psig, which is, I believe, the extra severe accident in 10 CFR 71.

Q But the kind of thing that you're talking about that could impede the flow would be a mud plug, for example?

A That would be one thing.

C9

Q Now are any of you gentlemen responsible for Table 6-2, or did you rely on Table 6-2?

A (Witness Glenn) I'm responsible for Table 6-2. I am solely responsible for it.

Q But did you rely on it, Mr. Hodge?

A (Witness Hodge) Yes, I did.

Q All right.

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Q Mr. Glenn, looking at Table 6-2-- Do you gentlemen have a copy of it?

A I do

Q Page 26 of Staff No. 3, the Environmental Impact Appraisal, why did you select the maximum individual as a person located 100 meters downwind from the accident?

A (Witness Glenn) Okay. These accident scenarios, of course, involve the release and disperal of material. It's assumed to produce a cloud of aerosolized debris instantaneously at the accident site. The initial distribution of the aerosol mass with height is assumed to be a line source extending from the ground to a height of ten meters in this case. And the initial concentration increases with height. The use of such initial distribution is justified for accidents in which fires are -- accidents that involve fires or residual energy to provide an aerosol cloud to be released from the accident site.

The dose calculated from a 10-meter high line source is not distinguishable from that of a point source at distances downwind on the order of the 100 meters used in the EIA. And, therefore, at 100 meters the distribution with height is unimportant.

With a 10-meter high release point we assumed .1 meter per second wind speed, which is about 3 miles an hour. So you would have a very rapid plume rise, in this case

wb2 1 assumed to be 10 meters high. The 100 meters is where the
2 plume touches the ground, and, therefore, it is where the
3 maximum concentration will be.
4 I can visualize a person standing 50 meters from a
5 cask that is burning and watching the plume go over his head.
9.020 6 He would be exposed to some concentration, but much lower
7 than a person in the centerline of the plume.
8 Another important thing to remember is, in this
9 case with the amount of energy that is released the plume rise
10 wouldbe in the order of 10 meters. And this individual at
11 100 meters downwind from the site would probably indeed
12 watch the cloud go over his head.
13 So the assumptions that are made are conservative.
14 Q How many miles an hour is a .1 meter--
15 A .1 meter per second?
16 Q Yes.
17 A Three miles an hour.
18 Q So if you have a fairly strong wind, a 30-mile an
19 hour gust, that would not allow the plume to rise as far?
20 A You would get much more rapid-- Well, let's see:
21 I'm at a loss for a word:-- more rapid dilution of the cloud
22 because of the turbulence involved with such strong winds.
23 The material would be carried faster and the exposure would be
24 less. This assume that the individual stands there for two
25 hours, also.

If I was closer to the fire I'm definitely not going to stand in the smoke plume of a burning truck for two hours.

Q Where is that two-hour.... Is that given in the table or in the EIA anywhere?

A It is not.

Q Have you considered the maximum individual is a firefighter, perhaps with a smoke mask, with whatever equipment he might have, right in close to the burning material and the coolant leak?

A Most firefighting brigades or fire departments that are involved in fighting a hazardous material fire use self-contained breathing apparatus. And, as such, using self-contained breathing apparatus, the only exposure that these people would receive is from the air submersion dose from the krypton-85 that's involved that's released here. And with protective gear that they would have on they would essentially not be exposed to any of the beta radiation released from that. Their exposure would be no more than what the maximum individual's is, so long as they were wearing their Scott Air-Paks. They would have to spend two hours in the plume. If they spent ten minutes I still don't think that their dose would be equivalent to this.

Q All right.

Have you excluded the case of an unprotected

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passer-by or the first firefighter on the scene attempting to pull the driver out of the truck, for example?

A I seriously doubt that such an operation would take two hours. If it took five minutes the person's exposure still would not be any greater than the maximum individual's.

Q Did you consider the case of a group of students from either of these two schools gathering by to watch the events?

A Yes, I did. I assumed that the students at Clemson University all gathered at the edge of the university property, which is 400 meters away. Actually, I assumed these people to be evenly distributed over a much larger area.

Q 400 meters is a substantial distance from which to watch a spectacular fire.

A Under the actual conditions that I would expect for this fire, 400 meters would probably correspond to the site of the maximum individual, and that dose would probably be more than what is listed here.

Q Are you envisioning the police, or whatever, keeping these people away?

A My experience in observing hazardous material wrecks would indicate that the police would keep people away from these vicinities.

Q 400 meters is a quarter of a mile, about.

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A I have witnessed wrecks on Interstate-5 just north of Eugene, Oregon, where the distance was more on the order of five or ten miles. It was a rural situation. But they kept the people a great distance away. And the net result at the end of that accident was, there was no hazard. It was a precautionary procedure only.

Q That is not particularized to the students at Clemson University, is it, in any way?

A It just relates that people are going to be kept at a distance.

Q If you were to consider-- Well, let's say, as those students halve the distance they quadruple the dose; would that be the case?

A This is not inverse square.

Q Why not?

A This is not a contained source. The inverse square law only applies to a point source, and there are other things involved here. I would not characterize this specifically as inverse square.

Q Didn't you use a point source in calculating the effects 400 meters away?

A The inverse square law is usually only applied to a sealed source, or a source that is where radiation is emitted from; not the radioactive material that is distributed as a cloud, as in burning. There are other things involved in

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that.

Q Are you talking about dilution over that space, 400 meters?

A Yes.

Q What kind of factors? How are you treating that mathematically?

A In this particular case the scenario assumes that there's uniform wind direction; that the wind is blowing at 3 miles an hour, carrying this material directly toward the individuals in question.

Q And how much has it been diluted? How do you calculate that?

A The chi/Q at 100 meters is $3x10^{-2}$, and the chi/Q value at 400 meters is $3x10^{-3}$, or a factor of 10 difference. The distance is a factor of 4. That would indicate that by inverse squares the dose at 100 meters should be 4 times what it is --the dilution factor; excuse me; should be 4 times t it is at 400 meters. Which indicates that-- And these are calculated by standard approved chi/Q equations.

Q Thank you.

Going through the written testimony, on page 2 you have "Spent fuel is highly radioactive." May I ask you how many curies there are in each shipment? --if anybody knows.

A (Witness Hodge) I know that the quantity of radioactivity contained in a large rail cask, which would

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contain about 10 times the fuel contained in the cask under discussion here, is on the order of 10 million curies.

Q So you're saying, you're guessing an informed guess would be one million curies?

A Correct.

Q What is the age of that fuel?

A I'm sorry, I don't seem to find the exact number used in that calculation. As I recall, it's on the order of one year.

Q So that this is -- we're talking about 270-day fuel is 1.5 million curies, is that a decent approximation?

A I don't know the answer to that question.

Q Did anyone calculate the total integrated dosage in rems outside the cask, the dose rate?

A (Witness Glenn) From a routine, undamaged cask?

Q Yes, sir.

A The dose that one would expect from a cask containing 270-day old fuel at a distance of two meters from the cask would be about 2.5 mr. per hour, about one-fourth of the regulatory limit.

Q That's at two meters. Do you have it at the surface?

A My calculations indicate it would be about 10 mr. per hour.

Q Do you know the total number of rads leaving the

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cask surface?

A I don't understand your question, I guess. A rad and a rem, the quality factor for rad and rem for this type of radiation is one. Therefore, a rad and a rem are equivalent, talking about penetrating gamma radiation.

If you want to include neutron radiation in that, the low levels of neutron radiation, the quality factor would be maybe two or three.

Q Is your quality factor the same as the biological effectiveness ratio?

A Do you mean RBE, radiological biological equivalent? The two are essentially the same.

Q Yes.

Your answer was yes, it is?

CHAIRMAN MILLER: The answer was they're essentially the same, I believe.

WITNESS GLENN: One is used by radiation biologists and one is used by health physicists, essentially.

BY MR. BLUM:

Q What you've given me is the dose at a particular -- or the dose rate at a particular point. Have you accumulated, integrated the entire dose rate over the owhole surface of the cask in all directions?

A (Witness Glenn) No.

Q When you were calculating -- do you know how thick

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the neutron shield is on the cask involved?

A It is 4.5 inches thick.

Q This has a steel shell around it, does it not containing a liquid?

A That liquid is 4.5 inches thick.

Q All right. What is the thickness of the steel, stainless, whatever, outside that?

A I do not know.

Q It's called the neutron shield tank, I think. You're saying you don't know how thick that is?

A I don't have that information with me, no.

Q Is it easy to puncture that, relatively easy in terms of puncturing the cask?

A Yes.

Q In your calculations of accidents, did you run those calculations with that shield punctured?

A Section 6.1.2, page 35 of the EIA addresses itself toward the loss of the neutron shield.

Q All right.

And you have a member of the public 10 meters from the cask for two hours.

A That's correct.

Q Now if that were to decrease to three meters, that member of the public remaining there for two hours would get, I suppose, 10 percent of the annual background rate, is

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that true?

A No.

Q Why not?

A You said three meters?

Q If the distance were to decrease from 10 meters to three meters, what would that do to the -- well how would the dose change?

A Excuse me, you are correct.

Q And at one meter, what would the percentage of the dose rate be?

A It would be 100 times higher.

Q Now that would assume, for instance, if you had a firefighter or policeman standing there directing traffic around this cask without knowing what was happening there, a person standing there for two hours one meter away might receive 100 percent of background?

A Loss of the neutron shield would not require a stoppage of the shipment. I would not see why this would be -- why anyone would be in one location for two hours. The two hours was simply put in as a means of giving a person an idea or reference point as to what the dose would be.

Q Well I'm assuming that if you have a truck collision that causes a rupture of this jacket.

A Excuse me, no one assumed that there was a collision. The only thing that's assumed is that the neutron

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shield is lost.

Q Well are you looking at page 34, 6.1.1?

A Excuse me?

Q If you'll read the first sentence of that section --

A You're right, I'm sorry.

Q So under those circumstances a member of a public safety force might well receive 100 percent of background dosage?

A If he were to stay beside the cask at one meter for two hours, that would be the case.

Q Do you know anything about the pressure which a modern fire truck can develop in producing a stream of water?

A I do not.

Q I see. You didn't consider whether that could penetrate this steel jacket, did you?

A I did not.

Q Would it alarm you if that were the case?

A What were the case?

Q If a modern fire truck could develop an adequate enough pressure out of its hoses to penetrate this outer steel jacket?

A My personal opinion is that I don't think that would happen. I do not have any numbers in front of me to estimate what the thickness of that jacket is, but I would think it would be on the order of at least a quarter of an

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1 inch. I don't know.

2 Q Now I notice at the bottom of page four of your

3 testimony you're talking about spent fuel casks which have

4 been subjected to physical tests. Do you all agree that the

5 cask tested was not this particular cask?

6 A (Witness Hodge) Yes.

7 Q Is the only relevance of those tests the fact

8 that you were able to verify in some measure your predictive

9 analyses, your methods of analysis?

10 A That is the relevance we see.

11 Q On page six, you talk about a number of 3600

12 spent fuel shipments as of 1972.

13 Do you know how many spent fuel shipments,

14 commercial shipments, have been made since 1970? Excuse me,

15 I'm sorry, page five.

16 A Will you repeat the question?

17 Q How many commercial spent fuel shipments have

18 there been since 1970, if you know?

19 A We can only estimate the number.

20 Q Well what would your estimate be?

21 A Based on the shipping rate for 1975 determine

22 from a recent survey conducted by the NRC of 270 shipments

23 per year, in the nine years since 1970 --

24 Q Are you talking about 3000 per decade?

25 A I think the answer is 2430 -- 2700 per decade.

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Q All right.

And of those shipments, two have encountered a disabling accident?

A I'm sorry, I didn't get all the question.

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Q Of those 2700 shipments, two have encountered a disabling accident, isn't that true?

A Yes.

Q And what accident rate is that?

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(Pause.)

CHAIRMAN MILLER: Who's got the ball?

MR. BLUM: They're developing a number.

CHAIRMAN MILLER: Very well.

(Pause.)

CHAIRMAN MILLER: We could go for an hour sometimes and each would think the other was doing it.

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(Laughter.)

A (Witness Hodge) I estimate 1×10^{-7} accidents per shipment, per kilometer.

Q How did you get the kilometer factor in there? Did you work in an average distance per trip?

A Yes, I did.

Q What's the average distance per trip?

A The 270 shipments per year is composed of 251 shipments by truck at an average distance of 2530 kilometers and 17 shipments by rail at an average distance of 1210 kilometers. And I estimated the annual rate to apply to 30 years.

Q The shipments by rail at what average distance?

A 1210 kilometers.

Q 2530 kilometers is about 744 miles -- oh, I'm sorry.

(Pause.)

CHAIRMAN MILLER: Is this a meaningful exercise, gentlemen?

MR. BLUM: I'm going to try and focus it on what we're doing here, making 300 trips at 170 miles --

CHAIRMAN MILLER: By truck or rail?

MR. BLUM: By truck. I don't know the rail components of those shipments. I was not aware of those.

CHAIRMAN MILLER: See if you can relate it to what we're talking about here.

BY MR. BLUM:

Q 2530 kilometers is 1570 miles?

A (Witness Hodge) I'm sorry, I don't have that conversion.

(Pause.)

CHAIRMAN MILLER: You know, we're taking a lot of time to do this.

MR. BLUM: I know, and I was about to suggest that we could come back to this and pick it up, and do it. Because I think it does make some sense to us.

BY MR. BLUM:

Q Looking at your page 7, this might get us to what we're talking about, you have a chart at the bottom, concerning the relative frequency of minor, moderate, severe, extra severe, and so on, and extreme accidents.

There's nothing in that to say that next year might not be the year that you get an extreme accident, is there?

A (Witness Hodge) That's correct.

Q In part, this is more familiar to me, at any rate, it has predictions about when -- what kind of flood you might expect every 100 years.

Are you familiar with those kinds of predictions?

A I am not familiar with the application to floods, but I think that the two are analogous, yes.

Q So that when they talk about a 100-year flood, they're saying how high the water might get once in 100 years?

A Correct.

Q And you're saying that once in 50 years you might get a moderate accident?

A Correct .

Q So that it's quite possible to get two 100-year floods in consecutive years?

A Correct.

Q And it is possible to get a severe accident next year, even though you would only expect one every 2500 years, based on your report?

A Correct.

Q All right.

Now, looking at the top of page 8, in the Sandia tests you had -- in one test I believe you had a cask traveling at -- excuse me -- you had a truck traveling at 135 kilometers per hour. That was the most serious crash tested, was it not?

A I'm sorry. Are you referring to page 8?

Q Yes, top of page 8.

A I don't know that -- the test was 84 miles per hour.

Q That was the speed of the truck. Do you happen to know the speed of the cask when it hit the wall?

A No, I do not.

Q Or immediately prior to it hitting the wall?

A No.

Q Could you find that out?

A No, I cannot.

Q Do you not have a copy of that available, the Sandia report? Isn't that figure in there somewhere?

(Pause.)

You can get that to us, perhaps, after the next break. I'd appreciate it.

A Okay

Q All r. , Mr. Looking at page 9 -- first of all, I don't know who did the calculations of maximum internal heat load. Who did those?

A (Witness Jackson) Are you talking about what would be the maximum internal heat load for a shipment of Oconee fuel? What is the question?

Q All right. I want to ask several questions. First, about the maximum internal heat load that might be generated in the accident in which the coolant is lost, internal cavity coolant, is lost.

A The internal heat load, we would have to talk about a particular cask. There would be a requirement for --

CHAIRMAN MILLER: What did you use when you concluded that melting under normal or accident conditions

from an internal heat source is not credible? You must have been looking at something, didn't you?

WITNESS JACKSON: Right.

CHAIRMAN MILLER: What were you looking at under those circumstances?

WITNESS JACKSON: Well, these temperatures are such extreme values, the melting temperature, like 4500 degrees for uranium dioxide would be above a temeprature that you would expect fuel melting to occur when the heat loads that are normally shipped are, I believe, 100 kw. The fire accident conditions external to the cask have been computed up to 1750 degrees Fahrenheit.

So you wouldn't expect the internal heat generated in the cask to raise the temperature of the fuel to the melting point within the cask. That would be not credible for these types of heat loads.

CHAIRMAN MILLER: Did you actually make any calculations?

WITNESS JACKSON: I did not make any calculations.

BY MR. BLUM:

Q Well, are you familiar with a document which is put out by the Institute for Reactor Safety of the Technical Control Association, identified as NRC Translation Number 161, whose title is, "Working Report; Studies comparing the Greatest Possible Failure Sequences in a Processing

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Installation and in a Nuclear Power Plant," and further identified as Number 290 August 1976, to which, I guess, we should give a CESG number -- probably 6.

CHAIRMAN MILLER: CESG Exhibit 6? Does that seem to be next in order?

All right, that document as identified by counsel, will be marked as CESG Exhibit Number 6.

(The document referred to was marked for identification as CESG Exhibit 6.)

BY MR. BLUM:

Q Are you familiar with that study which, in part, considers the heat values built up in a shipping cask?

A (Witness Jackson) Yes, I have a copy of it, and I have looked at it to some extent.

Q All right.

Doesn't that document consider it quite possible that a cask loaded with 200-day old fuel might reach the melting point of the fuel cladding, does it not?

A Yes, it does. In fact, the study itself assumes that the fuel melts. That is the whole basis of the analysis.

CHAIRMAN MILLER: What temperatures does it consider?

WITNESS JACKSON: It considers loss of coolant of the pool where 1400 fuel assemblies are stored, and since this

is an adiabatic condition which no heat can be dissipated from the fuel elements themselves, the purpose of the study is to determine the mi[illegible]um time required to melt the fuel.

So the basic assumptions of the study assume at the onset that the fuel will melt, not that under realistic conditions that it would melt. In fact, a basic energy balance under the assumption assumes it would melt. There could be no other result.

If you take a quantity of fuel elements and impose an adiabatic boundary condition and some finite time, the fuel will melt.

They did look at some other -- in conjunction with this, they did look at some other values where they allow some small amount of cooling, to see how this related. But the basic idea of the study was to see the minimum time it would require to melt the fuel, and not if it was credible that the fuel would melt. But they were looking for the minimum time required to melt the fuel under a hypothetical scenario.

BY MR. BLUM:

Q Well, if you drained the coolant -- if we assume that that has happened, or a large percentage of it, and you have an external fire so that there's a minimal temperature gradient between the inside of the cask and the outside, don't you approach the conditions of that study?

A (Witness Jackson) No.

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wel 7

Q Why not?

A The cask is designed as a passive dissipating mechanism for dissipating the heat.

In a fire, you have a source input of only 1475 degree fire, or fires of that neighborhood, much below the melting temperature. So you have no source term outside the cask of temperatures larger than that.

Q Well, as I understand the cask, it is designed to use its coolant liquid to conduct heat away from the fuel assemblies and dissipate that into the atmosphere.

A Well, it would conduct fuel heat away from the fuel element and dissipate it to the atmosphere, even if coolant were not there. You would just have an increase in temperature, but well below the melting point.

Q Well, if you also insert a term -- I'm just reminded that I had very low grades in thermodynamics -- if you insert a term that builds up the outside temperature to 1475 degrees, you have a low temperature gradient, so it would get hotter faster, wouldn't it?

A Would you rephrase that? I didn't understand it.

Q If you have a low temperature gradient, if the temperature outside the cask is high, the cask would heat up hotter and faster.

A A low temperature gradient? You mean a low temperature with respect to . . .I don't understand. What is

wel 3

1 the gradient between what two temperatures?

2 Q Between the spent fuel assembly and the outside

3 world, the world immediately outside the cask?

4 A During the half-hour fire, or the length of fire

5 that you would consider, the fire source temperature is above

6 the steady-state temperature of the fuel assembly in the

7 cask. But this doesn't go on forever. And the maximum

8 temperature that anything could approach, whether or not

9 internal heat generation would be the source temperature

10 itself.

11 So once you reach the 1475 degrees, then you would

12 just increase the temperature of the fuel assembly until

13 energy balance occurs, so that you could then dissipate all

14 the energy contained in the fuel assembly to this source

15 temperature.

16 Q All right.

17 How hot would the fuel -- how hot would 270-day

18 old fuel get under those conditions?

19 A With a loss of coolant under normal conditions?

20 Q Under the fire conditions.

21 A Under the fire conditions? I made a calculation

22 of the temperature. I'll try to answer your question, but

23 let me give you some numbers.

24 I calculated the temperature of 270-day old fuel

25 in the NSF-4 cask for a loss of coolant for a 130 degree F.

wel 9

1 normal conditions with full load at a maximum peak temperature
2 of 740 degrees F.
3 I could possibly use this number to estimate the
4 temperature that you're speaking of in the fire accident, but
5 I didn't have the facilities to do that. But we could make
6 some estimation.
7 This would be approximately 610 degrees above the
8 ambient temperature at these conditions. If we added 610
9 degrees delta T approximation to the 1475 degree fire, we
10 would have . . .
11 Q 2,095 degrees?
12 A 2,095. That's approximate. Those are just
13 approximations.
14 You can see that the fuel temperature under normal
15 conditions with a loss of coolant which is not what this is
16 designed for, wouldn't reach anywhere near melting temperature,
17 nor, in my estimation, would it during fire or accident
18 conditions for this particular fuel.
19 Q At what point do you start getting fuel cladding
20 creep? At what temperature?
21 A The 100-hour creep is in the neighborhood of 900
22 to 1000 degrees Fahrenheit for the cladding of this particular
23 fuel.
24 Q Well, that's well below this 2,095 degrees.
25 A That's true. That's creep. That's 100-hour creep

values.

CHAIRMAN WILDER: What does the term "100-hour creep" mean? Is that a term of art?

WITNESS JACKSON: The internal pressure in the fuel assembly is built up either to temperature so you have a pressurization of inside of a fuel rod, so the fuel rod is subjected to a continual stress due to this. So at this particular temperature of -- let's use round numbers -- of 1000 degrees Fahrenheit, then you might expect the fuel pins to rupture after 100 hours at these conditions of 1000 degrees Fahrenheit, which is above this number of loss of coolant under normal conditions.

BY MR. BLUM:

Q Yes, but we've arrived at a temperature of 2,095 degrees, which is about twice as high as where you start getting fuel cladding creep.

Do you have any prediction of that temperature?

(Pause.)

It would be less than 100-hour creep.

A (Witness Jackson) Yes, it would.

Q Do you know how long, or what probability there would be of getting this fuel cladding creep at 2000 degrees?

A First of all, I'd like to qualify that that was a calculation of 2,095 degrees. You saw the estimation I went through to get that. It's some upper bound. So I

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1 wouldn't like to be held at that, that that would be the
2 actual value. First of all, I think we can keep hypothesizing
3 worse and worse scenarios, and getting -- I think you should
4 look at this with all the factors properly put into place,
5 analytically, and calculate a number and base it on that
6 first.
7 But, in answer to your question, I suppose you
8 could have creep rupture at these temperatures. In fact, I
9 think you would have creep rupture at 2000 degrees. But
10 I was just using that as a very, very upper limit. I'd have
11 to look at it in more analytical detail, using computer models,
12 to be able to --
13 Q You haven't done that, I take it?
14 A No, I haven't.
15 Q All right. As soon as you start getting any kind
16 of creep, you start releasing radioactive volatiles, isn't
17 that true?
18 A When you have creep rupture, you can release a
19 certain percentage of the volatile gases -- of the noble
20 gases and the volatile materials in -- not 100 percent of the
21 inventory, but a percentage of this as a function of
22 temperature.
23
24
25

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BY MR. BLUM:

Q If you assume that -- and I don't know the likelihood of this occurring or not occurring, but if you assume that somebody has pulled an assembly that's only 200 days old as opposed to 207 days old and inserted that, have you done any calculations about the heat buildup under your normal conditions?

270

MR. HOEFLING: Objection to that question.

CHAIRMAN MILLER: What's the basis of that objection?

MR. HOEFLING: Well, the proposed campaign is for 270-day-old fuel. The Staff is recommending that a license condition to that effect be imposed and there would be a requirement to ship only 270-day-old fuel which would be enforced by the Inspection and Enforcement Division of the Commission.

I don't think that we really have an adequate foundation to pose that kind of question.

CHAIRMAN MILLER: Is such a limitation contained in the application?

MR. BLUM: The application requested 120-day-old fuel.

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MR. HOEFLING: No such condition was contained.

CHAIRMAN MILLER: Well, in the absence of any limitation in the application itself as it is before the Board, we would have to permit inquiry into that, unless the Staff might--

So you may answer.

WITNESS Would you restate the question, please?

BY MR. BLUM:

Q This GErman study we've been talking about, CESG Number 6, discussed 200-day-old fuel.

Did you consider the loss-of-coolant accident operating on 200-day-old fuel?

A (Witness Jackson) I might not clearly understand your question but I'll try to answer.

This NSF-4 shipping cask, the license requirement for that cask corresponds to 11.5 Kw. That's I believe 120-day-old fuel. It's not specified but that's the limit of the internal heat load.

The 270-day-old Oconee fuel would correspond to about 7.1 Kw, considering a peaking factor of 1-1/2 in that value.

So the Oconee fuel at 270 days is only about 61 percent of the authorized heat load for the NSF-4 cask.

I don't know if that answers your question or not.

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Q The question was: Did you determine in the event of a loss-of-coolant accident the internal temperature of 200-day-old fuel or 120-day-old fuel?

CHAIRMAN MILLER: Did you?

WITNESS JACKSON: No, I didn't.

BY MR. BLUM:

Q I mean you gave me a comparable number of 740 degrees Fahrenheit for 270-day-old fuel.

A (Witness Jackson) I recall that calculation this week-end since I've been here as an update to an interrogatory I believe, to verify in my own mind all the calculations.

I calculated that earlier as 810 and I calculated that with my best assumptions this week-end, and that's the reason I calculated it.

Q Did any of you gentlemen participate in the decision to limit the fuel to be transported to 270-day-old fuel?

A (Witness Hodge) I did not.

A (Witness Glenn) I did not.

A (Witness Jackson) I did not.

Q You don't know why that was made, or how that number was arrived at? Anybody?

A I did not.

A (Witness Hodge) No.

Q Have any of you actually been over the route that we're talking about, or go into McGuire on I-85 or I-77?

POOR ORIGINAL

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A (Witness Glenn) I have.

A (Witness Hodge) I have.

Q Have you been over the secondary road system up near the Oconee Plant itself?

A (Witness Glenn) I have.

Q Is there anything about those roads that would increase accident possibility?

A (Witness Hodge) I can't identify any such factors.

Q Have you been over the intersection between I-77 and I-85 through which this truck, at least under one proposal, is supposed to pass?

A (Witness Glenn) I have.

A (Witness Hodge) Yes.

Q Are you aware there have been 11 accidents at that particular intersection, truck accidents, since it was opened a few years ago?

A (Witness Glenn) I'm not aware of it, of the specific number.

Q Did you make a particular study of that particular intersection?

A No.

Q If in fact you were dealing with a particularly hazardous intersection, and I believe the County Commission has recognized it as that in its transmission to this Board, would affect any of your calculations about accident rates and

eb5

so on?

A My information as to the type of accidents you would see after witnessing that particular stretch of road is that the accident would occur at a relatively low speed. And my experience in witnessing that type of accident is such that the trailer just turns over. I did not see anything that would force a serious impact on the cask itself.

I think the main problem would be getting the equipment available to right the cask, as was brought up in other cross-examination previously in these hearings.

Q All right.

Now if in fact it's true, as I think the County Commission recognized, that there have been any number of truck turnovers at that intersection, doesn't that alter the probability of a petroleum truck colliding with the overturned cask?

A That would have to assume that the petroleum either also overturned at exactly the same location or went off the road because unless the vehicle turned over on that stretch of road after witnessing it, I would assume that the cask would no longer be on the roadway.

Q Isn't there a stretch of that intersection where the two roads run parallel, the entry ramp is parallel to --

A I do not believe that--that is a part of the curve that is leading into the curve, is it not? I'm not-- I'd

eb6 have to refresh my memory on that.

Q My memory of it is it's coming out of that curve.

A Okay. I don't remember that particular section.

Q All right.

You have made no particular accident study of that intersection?

A That type of an accident that would result there would be a standard type of transportation accident. I don't think that there would be enough energy available to cause any damage to the cask.

Q Looking at your page 11 of this testimony, the second paragraph, I'm not sure that I understand that first sentence.

A (Witness Hodge) The sentence refers to the preceding paragraph, in which the third sentence says:

> "Assumed accidents involving spent fuel casks shipped at the 1975 rate infer an expected value of about 0.00004 latent cancer fatalities from that year's spent fuel shipping."

While not siad explicitly the sentence is referring to transportation through the nation.

Q And you're estimating that this set of shipments would give you a value of one-tenth of that?

A Yes.

(Pause.)

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Q Are any of you familiar with the experiences of Duke Power in its shipments to the Crystal River facility?

A No.

A (Witness Glenn) No.

Q Are you familiar with the wipe test which I think was alluded to by Dr. Luebke a while ago?

A I'm familiar with the wipe test in general. I'm not familiar with the exact procedure that Duke uses, the type of paper used, area.

Q Did you examine the inspection reports of the shipments? I think it was identified yesterday as CESG Exhibit Number 2 for identification purposes. Are any of you familiar with that?

A (Witness Hodge) No.

A (Witness Glenn) No.

Q In this document which we received in discovery it indicated general beta-gamma levels of about 30,000 DPM per 100 centimeters squared at a maximum of about 100,000 DPM per 100 centimeters squared. This was at-- Can you account for that in any way?

I show you the entire section if somebody wants to read that.

(Handing document to the witness.)

(Witnesses reviewing document.)

A Would you repeat your question, please?

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Q Can you account for the levels of disintegration per minute encountered in this particular test?

A No.

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Q Do you have any ideas about where they might have come from, or is it within your area of expertise?

MR. MC GARRY: I would object, Mr. Chairman.

CHAIRMAN MILLER: What's the basis?

MR. MC GARRY: The basis is that this witness has been asked that on at least three occasions, if he's familiar with this report. In each instance he replied he was not.

He was finally given the document to look at. He then read that document and was asked a subsequent question to which he was unable to respond.

I think to pursue this course of examination after three to four answers in the negative by the witness is prolonging the hearing.

CHAIRMAN MILLER: I agree with you.

What's the basis for the continued effort?

MR. BLUM: Well, I was told the last time around that the Staff would be able to account for this, this particular feature of the NAC-1 cask, and that in practice it seems to fail this test, I guess, in summary. And when I asked the Applicant's witnesses about this result, I was told that they didn't know about it.

And now that I'm asking the Staff's witnesses, I'm also told that they don't know about it. And if that's the case, I guess I'll have to leave it at that.

CHAIRMAN MILLER: Well, let me ask Staff Counsel:

mrb2 Is there someone who is prepared to give the information?

MR. HOEFLING: No, Mr. Chairman.

This is an inspection report that relates to what has happened, and also relates -- I believe it also indicates that tests conducted by FPC were inconclusive, but did not appear to indicate that excessive surface contamination resulted from any leakage of the cask contents.

Licensee representatives speculated that the increased surface contamination resulted from leeching or [illegible] contamination [illegible]. Region [illegible] with other licensees and emergency services confirmed that this had been experienced.

That's the extent of the Staff's information on that point.

CHAIRMAN MILLER: Well, will the Staff attempt to obtain further information or analyze or otherwise determine the cause?

MR. HOEFLING: Well, Mr. Chairman, I think this does serve as the Staff analysis.

CHAIRMAN MILLER: Pardon me?

MR. HOEFLING: I say, I think this does serve to be a Staff analysis.

Staff indicates it did not appear to indicate any excessive surface contamination as a result from leakage.

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mpb3 Information was sought by other individuals and confirmed that that was the case.

CHAIRMAN MILLER: What are these, hot spots on the cask?

DR. LUEBKE: Well, as I said earlier today, it's my recollection that this is not the only time this has happened.

CHAIRMAN MILLER: Well, it would appear that it's certainly fair cross-examination. I hesitate to think that the Staff would let the testimony just die right here, that you've got certain hot spots and other things and nobody is going to get any kind of rational explanation. Who's the man? Who do you want us to ask?

MR. HOEFLING: Well, Mr. Chairman, I think that what I can see from this inspection report, swipe tests were taken before the cask left the facility. Those swipe tests indicated that the limits were met.

When the cask arrived at Florida Power and Light in Crystal River, certain casks indicated localized high values of contamination.

CHAIRMAN MILLER: Are those hot spots, in layman's language?

MR. HOEFLING: I don't know whether that language applies.

CHAIRMAN MILLER: Well, what do you want to call

wpb4 it?

I think the public is entitled to know what we're talking about and why.

MR. MC GARRY: Mr. Chairman, if I may interrupt?

CHAIRMAN MILLER: All right, Mr. McGarry.

MR. MC GARRY: The Applicant will have a witness tomorrow who will be prepared to address the question of hot spots.

CHAIRMAN MILLER: All right.

I guess we'd better let it go at that. Staff's witnesses apparently are not able to.

So we will sustain the objection now on the ground that it's not relevant with regards -- you've asked it three or four times and they just don't seem to have information. And the record will stand at that point.

Now you've heard Mr. McGarry. The Applicant, Licensee will produce a witness tomorrow who is knowledgeable and may be interrogated in that respect.

Is that correct, Mr. McGarry?

MR. MC GARRY: That's correct.

CHAIRMAN MILLER: Very well.

You may proceed.

MR. BLUM: That's our last question, Mr. Chairman.

CHAIRMAN MILLER: Very well.

Are there any other questions on cross-examination?

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MR. HOEFLING: Mr. Chairman, I think that a couple of things are kind of unclear on the record.

We had a question related to cask speed at the Sandia test which Dr. Hodge was not able to answer. Are we clear now that we don't have an answer for that?

It seemed to be hanging as to what was going to happen.

MR. BLUM: He was going to find that and report back to us.

CHAIRMAN MILLER: Yes.

Well, are you able to? What's the state of your information?

WITNESS HODGE: I have found some information. I have a copy of my reference one in the testimony, entitled Statement For the Senate Subcommittees on Science, Technology and Space and Surface Transport, authored by Mr. Robert M. Jefferson of Sandia Laboratories, dated August 16, 1973.

In this document Mr. Jefferson discusses the test of spent fuel casks conducted at Sandia Laboratories, and further, the entire program of his testing.

The first phase of the program involved testing scale models, and involved computer calculations to verify those scale model tests. Two collisions of spent fuel casks mounted on trucks into relatively unmoveable walls were conducted, one at a nominal 60 miles an hour, and one at a nominal

mpb3 80 miles per hour.

In this document a graph is given comparing scale models with results, full scale results in competition, results for the test at 60 miles an hour, and then the description of the 80 mile an hour test is described with a sentence:

"Here, as in the 60 mile per hour test, the calculated scale model and full scale results were in close agreement."

Referring then to another graph giving computational results for the cask velocity in the 80 mile per hour test, two curves are given, one for favorable conditions of the cask being tied to the trailer with a tie-down mechanism of sufficient strength to arrest -- excuse me, let me find the right language.

(Pause.)

CHAIRMAN MILLER: Is this responsive to your request?

MR. BLUM: I think he's about to get to it.

WITNESS HODGE: Anyway, the tie-down is associated with the number 9g for acceleration, and the unfavorable condition assumes the cask is not tied down and the calculation result for the impact velocity for the cask on the unfavorable condition I estimate to be about 75 miles an hour -- no, excuse me, kilometers per hour -- excuse me again, miles per hour, for the favorable condition, 65.

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MR. HOEFLING: Miles per hour, just so the record is clear?

WITNESS HODGE: Miles per hour, that's right.

BY MR. BLUM:

Q That assumes the speed or the velocity of the cask is reduced by the type of trunnion that attaches it to the trailer.

A (Witness Hodge) Yes.

Q Is there any factor worked in for the cask physically moving through the cab of the truck, as I think happened in those tests?

A The calculational model assumes some lumped masses, one representing the trailer of the truck and one representing the cask, and both coincide at the wall. But I'm not sure -- in fact, I do not know whether the cask moved through the cab mass in the calculation.

Q If it did that, it would further slow down the cask, would it not?

A Yes.

MR. BLUM: Thank you.

CHAIRMAN MILLER: Any further questions?

MR. HOEFLING: Mr. Chairman, there was still one other point. This was the accident rate. And I'm not sure we're totally finished with that.

CHAIRMAN MILLER: Well, what more do we need?

mpbd What is the question? What is the issue?

MR. BLUM: I'm going to need some time to work with that and decide whether I need to come back to it. I got a bunch of additional factors that began to enter into the calculation and made it cumbersome to deal with. And, well, it's 25 to 5:00 now, and I think probably it would take the rest of the day for us to work through that.

CHAIRMAN MILLER: Well, once you work through it, where would we be?

MR. BLUM: I was moving towards testing the probability of the accident at this particular -- during this particular set of transportation, testing the calculations, in fact.

CHAIRMAN MILLER: How significant is this to your case?

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MR. HOEFLING: Mr. Chairman, two members of the panel here are in a position to provide some information on the Department of Energy emergency response team and perhaps they could do that and Mr. Blum could --

CHAIRMAN MILLER: I think Dr. Luebke has a question also he might as well ask at this time.

MR. LUEBKE: Well as a pre-empt to the question, earlier today I took official notice of this General Accounting Office document. I think that's been stricken from the record in the process of some action that took place, so I'll do it again.

The Comptroller General has made a Report to Congress which has a number EMD-79-18, dated May 7, 1979, titled "Federal Actions are Needed to Improve Safety and Security of Nuclear Materials Transportation." And in it, I refer to I think it's called digest, it's sort of an introduction, page two. It says: "Neither agency"-- meaning the Department of Transportation or the Nuclear Regulatory Commission -- "independently inspects these packages

> to assure they are constructed properly and continue to meet federal standards after repeated use."

With that background, I looked at the testimony and I read, for instance, on page three near the top of the page:

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"The NRC reviews the designs for certification of compliance...," et cetera, et cetera.

In the bottom paragraph near the middle it says:

"In the case of a spent fuel cask performance standard is a series of tests applied...," et cetera, et cetera.

I go to the conclusion on page 13:

"Spent fuel casks are designed....," et cetera, et cetera.

What I'm missing here, gentlemen, is it doesn't say the casks to be used by the Duke Power Company in making these shipments is designed, et cetera, et cetera. This entire document reads to me as a generality and I'm just a little bit concerned about that.

CHAIRMAN MILLER: Well can any of you enlighten us?

WITNESS JACKSON: The NFS-4 cask is certified by NRC to meet the standards of 10 CFR 71. I don't know if it's addressed specifically in this.

DR. LUEBKE: I just don't remember seeing that in here.

CHAIRMAN MILLER: Is it contained in your testimony?

WITNESS HODGE: The individual cask design is not called out in the testimony.

DR. LUEBKE: That confirms my observation, then.

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MR. HOEFLING: Mr. Chairman, can I speak to that?

CHAIRMAN MILLER: Yes.

MR. HOEFLING: The Commission has regulations which deal with the adequacy of casks, and any cask that is used to ship fuel has to meet those regulations and be certified and receive a certificate of compliance.

We've had some discussion about the NSF cask which does have a certificate of compliance, Certificate Number 6698.

However, it is not contemplated that these shipments would be limited to the NFS-4 cask, but that these shipments would be permitted to be made in any cask that has received a certificate of compliance from the Commission.

And this is why the testimony did not specifically state that the NFS-4 cask would be the one used in the shipments, rather, any cask which has an effective certificate of compliance demonstrating that the Commission's regulations have been met could be used to make these transshipments.

DR. LUEBKE: That makes one become real curious about the details of the review that leads to the certificate, the mechanics of it, rather than just sort of pass your hand over it and say we've reviewed it and --

MR. HOEFLING: Well I think we're getting into an area here that could be viewed --

DR. LUEBKE: Couldn't you have said in this document

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that the cask to be used by the Duke Power Company is thus and so?

MR. HOEFLING: No I don't believe so, Dr. Luebke, because in fact once a certificate has been issued for a cask, basically what that means is that that cask is certified to transship fuel and it can transship fuel from any facility to any other facility. It's in the nature of a general license and there's simply no site specificity to those licenses. They're issued after a review on a docket to determine compliance and what we, in effect, have here is a license from the Commission that says that these casks are acceptable for use and the Staff does not see how we could deny, based on a Commission grant of a license, that we could deny any utility the right to use that cask to make a transshipment.

DR. LUEBKE: It seems to me that Duke Power Company in their application could say what casks they're using, and I think probably did.

And from your statement right now, Mr. Hoefling, it would seem easy for you to write testimony which says The cask to be used by Duke Power Company does thus-and-so. I mean, why are you hedging?

MR. HOEFLING: I'm not hedging, it's quite simple to the Staff. The Commission has issued a general license for a number of casks and the Staff does not see how it can limit the nature of those licenses in any transshipment.

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The Staff frankly feels bound by what the Commission has done and doesn't feel that it has any authority or power to limit Duke Power Company to a specific cask when the Commission itself has issued a certificate, a general license for the use of these casks.

DR. LUEBKE: But it's this certificate and the process that the General Accounting Office is critical of.

MR. HOEFLING: All I can say to that, Dr. Luebke, is that the Commission has elaborate regulations that deal with casks.

DR. LUEBKE: I know.

MR. HOEFLING: -- and the question as to whether or not those regulations should be changed is one to be addressed to the Commission.

But in this proceeding we are bound by what determinations the Commission has made, and it's made a determination that this -- that casks that have effective certificates may be used to make these shipments at this time.

DR. LUEBKE: I guess there are many words in the regulations, I would agree with you, but I think Intervenor raised the question that the cask that was tested at Sandia is not the same cask that has being use by Duke Power Company. I think the answer was yes. And I think that's an example of some gap here.

CHAIRMAN MILLER: Well in the Environmental Impact

Appraisal, there are other studies made by the Staff, the technical Staff, what casks were assumed, presumed tested and the like.

MR. HOEFLING: I beg your pardon, Mr. Chairman.

CHAIRMAN MILLER: I say what casks, or the nature of what casks were assumed in the Environmental Impact Appraisal studies that were made by the Staff?

For example, Dr. Luebke has pointed out that Sandia studies apparently had as their subject a different kind of cask than that which was the subject of some testimony by Applicant's witnesses.

MR. HOEFLING: Well for the environmental impacts associated with these casks, we were dealing with dose rates which are regulatory limits and apply to all casks. It's a general --

DR. LUEBKE: It's a generic approach.

MR. HOEFLING: It's a generic approach to the acceptability of these transshipments, that's correct. And the reason for that is the general license that those casks carry.

DR. LUEBKE: But I guess the General Accounting Office is critical of proving that the particular casks that are on the highway comply with that generic language.

MR. HOEFLING: Well I don't know what the General Accounting Office's specific conclusions are interpreted to

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mean, but I can only come back to the fact that we do have casks that have certificates that have dose rate limitations that they must meet and that have characteristics both for normal and for accident situations that are well defined in the regulations, a quality assurance plan that they must meet, and it is these casks that we are looking at in this proceeding.

DR. LUEBKE: Well I don't want to belabor the point, but does it also follow that all casks in existence are proved?

MR. HOEFLING: No, only casks that have a certificate of compliance from the Commission are approved for these shipments.

DR. LUEBKE: But you don't say specifically, or I haven't seen specifically in this testimony that the Duke Power Company cask complies.

MR. HOEFLING: Well there is a, I suppose, a presumption here that Duke Power Company will make shipments in a cask which has a valid certificate of compliance, and it's the job of the Agency to insure that that indeed is the case. They would be acting illegally if they didn't.

DR. LUEBKE: But you don't want to write it?

MR. HOEFLING: I think it's really a legal, determination. The Staff's position is that Duke Power Company will not be permitted to make shipments in casks that don't have a Commission certificate of compliance.

DR. LUEBKE: Well all right. I'll give it up.

WITNESS JACKSON: The casks are certified for a number of requirements and I think that each shipment would meet as far as the heat in our requirements --

DR. LUEBKE: Yes, except that all afternoon I've felt that I've been listening to an NFS-4 cask.

MR. MC GARRY: Dr. Luebke, I have two observations. One, each one of these casks that are licensed will have a Safety Evaluation Report from the Staff. In addition, the Environmental Impact Appraisal does make specific reference in Section 3.3 of the NRC casks.

DR. LUEBKE: I was just troubled by the testimony.

MR. BLUM: I don't know if it's time for observations or for questions, but I think it's also true that neither of these casks presently has a license, that is, the license for this type cask and these particular ones have been withdrawn.

MR. HOEFLING: That's not technically correct.

CHAIRMAN MILLER: The two casks that were testified to as being owned by the Duke Power Company?

MR. BLUM: Yes, sir, and they are currently grounded or whatever.

MR. HOEFLING: That's a good word.

BY MR. BLUM:

Q Do any of you gentlemen know about these

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particular casks and the problems therewith?

A (Witness Glenn) I was familiar with the problem.

A (Witness Jackson) I know just a little bit about this, maybe I can shed a little bit of light on it. But the certificate of compliance which is an analysis of the design, my understanding is not being grounded, so to speak, to use the terminology before, but that compliance of some NSF-4 casks to meet the dimensional requirements of the certificate. That does not mean that there is any flaw in the design. That particular physical cask might not meet that.

Q You're saying the design is okay, it's these particular casks don't meet the design?

A And I'm saying that's the reason those particular physical casks would not be allowed to enter into shipment until it is determined that that cask does comply with the Commission's certificate.

DR. LUEBKE: So that would explain their testimony then. In other words, you really can't be explicit at this time today, you have to be general.

WITNESS JACKSON: I think it was given in a generic sense. I can see that other casks could be used as far as the Commission is concerned if they meet the requirements, I would think.

DR. LUEBKE: So you meant to be general.

WITNESS JACKSON: Yes, I believe so.

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CHAIRMAN MILLER: Anything further?

MR. BLUM: Yes. We did, in fact, use the time to do a short calculation.

BY MR. BLUM:

Q I don't know if you can verify this as I read it but based on what we were doing before, I think it was Mr. Hodge, we have two accidents in 2540 truck shipments over a 10-year period times an average of 1570 miles per shipment. That would give you the --

A (Witness Hodge) I used a 30 year period.

Q Well we were talking about -- I mean in the last 10 years there have been two accidents, two accidents disabling the truck described in your testimony.

CHAIRMAN MILLER: Is this correct?

WITNESS HODGE: I believe that's correct.

CHAIRMAN MILLER: What's the next factor?

BY MR. BLUM:

Q All right. So if you have two every 2540 shipments times 1570 miles per shipment, at least I got an accident rate of 4×10^{-7}.

A (Witness Hodge) I haven't calculated that number but it sounds acceptable.

Q All right. And if you multiply that figure times 300 shipments at 170 miles per shipment, which is 51×10^{3}, you get roughly 2×10^{-2} for your expected number of accidents,

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is that about right?

(Pause.)

Do you want me to go over it again?

A (Witness Hodge) Allow me a minute, please.

(Pause.)

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Repeat your number, please.

Q 2×10^{-2}.

A That's what I got also.

Q Okay.

And each of these accidents was roughly a moderate accident, was it not?

A No. I believe you might describe the accident -- I think you might describe both accidents as minor accidents.

Q But looking at this transfer program, roughly speaking we have a one in 50 chance of having some kind of a truck accident that would disable the tractor-trailer combination over the lifetime of this program.

A Perhaps we should discuss the word "disabling".

If I agree to that statement I would not mean the word "disabling" to mean that any radioactive material would be released.

Q With that limitation -- and I'll agree to that -- that's what you would expect, one chance in 50 that there will be some accident that would physically disable the tractor-trailer.

A Yes.

Q All right.

MR. BLUM: That's the number that we were looking for.

CHAIRMAN MILLER: All right.

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Two in 100, one in 50?

MR. BLUM: Yes.

CHAIRMAN MILLER: Very well.

Any other questions?

State of South Carolina?

MR. WILSON: Thank you, Mr. Chairman.

BY MR. WILSON:

Q Dr. Jackson, assuming the one in 50 accident rate, and the fact that in such an incident you're going to probably have to get a cask physically removed from the trailer, or right it back on another suitable conveyance, what kind of response can NRC, as far as the emergency response teams that were raised, what kind of assistance can they lend the states and local authorities in cleaning up the problem?

A (Witness Jackson) Are you addressing Mr. Hodge?

Q It could be anyone on the panel.

A (Witness Hodge) The Federal Government has a program called the inter-agency radiological assistance plan which constitutes 13 signatory agencies; facilities, personnel, and other properties of these agencies could be called into action.

The program is under the lead of the Department of Energy because it has access and directs the activities of several laboratories of national scope.

The plan is organized to include eight regional

mpb3 coordinating offices which are charged with responsibility and authority to convene radiological assistance teams. The policy of these people would be to report to the scene of accidents or other radiological emergencies, even those involving nuclear weapons, to lend assistance or to direct the emergency response until such time as state, other federal agencies or local agencies can come to take supervisory authority.

These teams would seek to minimize injuries to people, minimize loss of property, cope with radiological hazards, protect the public health and safety in whatever way they deem necessary.

The Nuclear Regulatory Commission is a signatory agency in this plan, but it would only -- if it were notified first of an accident, for example, it would notify the Department of Energy, a cognizant office or the nearest office and they would mobilize the team. And the Nuclear Regulatory Commission would assist only as requested.

Of course, these teams operate under some limitations. They are responsible for activities under the Department of Energy direction. Particular material source, byproduct or special nuclear material defined in the Atomic Energy Act or other ionizing radiation source related to an ERDA supported work activity -- I'm using the word ERDA, I'm sorry, Department of Energy -- and the essential role of the

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team would be to conduct monitoring or other operations limited to advising and directing -- or advising, mainly, the supervisory person in charge, from the local agency or other local authority.

The Department of Energy team would only conduct these operations until commercial assistance would become available.

Q All right, sir.

And what is the closest response region for the transshipment we're concerned with here?

A I believe that would be probably at Oak Ridge National Laboratories.

Q And do you have any idea how long it would take that response team to in fact reach the scene of an accident along this route?

A I don't have an exact estimate of the time -- or I don't have a very good estimate of the time, but I can say it would be within hours.

DR. LUEBKE: I would expect Savannah River to have such a team.

WITNESS HODGE: Yes, they would also have a team.

BY MR. WILSON:

Q Which of those -- There's some question as to which one should respond. Which one would take the lead, do you know?

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A (Witness Hodge) No, I do not know.

Q Is there any way for us to ascertain the answer to that?

A Yes. You could contact the -- I suppose you would contact the national coordinating office in Washington, D.C., or the regional coordinating office at Oak Ridge or Savannah River and ask the question.

DR. LUEBKE: That's the coordinating office of what?

WITNESS HODGE: They're called -- I suppose you'd say the Department of Energy Regional Coordinating Office of the Inter-Agency Radiological Assistance Plan.

BY MR. WILSON:

Q What was that, Radiological Assistance?

A (Witness Hodge) Plan.

Q Plan.

Earlier in the testimony -- I believe it starts on page 5 -- you reference the 1971 Tennessee accident, and I believe on the top of page 6 it had noted the fact that there was only minor damage to the cask itself.

Do you know whether or not that was an NFS-4 cask? And also, what do you consider "minor damage" in that context?

A The accident involved a shipment of spent fuel from the Peachbottom reactor which, if I'm not mistaken, is

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mpb6 a gas cooled reactor, much smaller in size than light water reactors such as Oconee and McGuire.

A minor accident involves dents and scratches on the surface of the cask, perhaps bent or deformed lids or bolts.

Q All right.

In an accident situation, I believe earlier on cross-examination Mr. Blum treated the loss of neutron shielding.

What kind of methods, if you can briefly describe, are available for ascertaining on an accident scene precisely what the nature of the problem is so as to avoid exascerbating it perhaps in removal efforts?

A Would you mind repeating your question?

Q Well, I'm looking for what kind of techniques as far as monitoring or whatever go, to ascertain what the precise problem may be if you're getting a high reading, for instance, on an accident scene; how do you go about ascertaining where the problem is without exascerbating it?

A Well, certainly the response personnel would survey the situation with radiological measuring instruments and determine an area close to the cask inside of which they would not want people to go, and essentially quarantine the cask. And then visual inspection would determine whether other power personnel might be required or other equipment,

mpb7 for example, shielding, heavy equipment moving -+ heavy material moving equipment or something like that. And then make the proper contacts back in your dispatch office.

WRB flws

Q I presume that the teams are adequately trained in--

A Yes, you may presume that.

Q --in making those responses.

Also earlier, I believe on cross, the point was raised about these casks, and in supplying the answer one of you gentlemen mentioned the fact that if the cask would later fail to meet the regulations -- I believe it was you, Dr. Jackson.--if a cask had been previously certified, that conditions, if you will, can later cause it to meet those regs, continue to meet those regs.

A (Witness Jackson) Well, the certificate of compliance describes a number of specific requirements that are spelled out and must be met. And our Office of Inspection and Enforcement would make these determinations about the shipments in the cask, to see that it is in compliance with the certificate. So in that respect it could be whatever would not meet the specifications as spelled out in the certificate of compliance.

In the particular instance we're talking about I think there are some dimensional requirements, but I'm not sure at this time why the dimensional requirements are not made. And what brought this about, I don't have direct knowledge of that.

Q Let me see if I understand it now, because a little

earlier in discovery we had mention made of a modified cask where some shielding had been deficient, and plates had been placed over the defective area. What kind of condition would bring about the necessity for adding such shielding? Rough handling, or what? What kind of thing are we looking at?

A I don't know. I would just be speculating. I don't know the particulars of that, as I said.

CHAIRMAN MILLER: Well, don't speculate. If you don't know, that's a sufficient answer.

BY MR. WILSON:

Q Are there any parts of the cask that are susceptible to wear, to wearing out, so as to cause them to fail to meet the regulations?

A (Witness Jackson) There is a maintenance and repair requirement for casks. O rings, things like this, that would encounter wear. And there is an inspection type of procedure to determine if they meet requirements, and periodic replacement of some parts. There are provisions for this type of maintenance.

Q I understand.

I presume that maintenance is normally performed on an as-needed basis by the holder of the case; is that correct?

A It's specified very definitely in the certificate of compliance, like the quarterly or semi-annual replacement

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of certain parts. I'm speaking in general terms, not to a specific thing. But it is spelled out very specifically in the certificate of compliance.

Q Is confirmation ever made on site by the NRC through inspectors of the changes and modifications?

A I don't work in the Office of Inspection and Enforcement, but I understand that this is what they do. I can't speak to this specifically, not having direct knowledge of it. But that's my impression, that they would do this type of thing. They are the part of the Agency that determines that the casks meet the certificate of compliance requirements as we spell them out.

The Safety Evaluation Report comes to our branch, we review the design and all the safety features, and make a determination of issuance of this certificate of compliance. Along with the certificates we spell out the requirements that are needed to be met; all the important factors like the internal heat loads and whatever the requirements are that we feel are important to the public health and safety. And these are spelled out in our certificate of compliance. And then the Office of Inspection and Enforcement determines if the physical cask meets these requirements. And anything that would relate to a specific shipment, they would determine that, too; in other words, that it does meet our requirements as a certified cask.

wb4

1 Q Do any of the other members of the panel know
2 whether or not that particular Inspection Division does in
3 fact go out in the field and periodically conduct inspections
4 of these casks, that they are maintained in compliance?
5 A (Witness Hodge) Yes, I'm aware that the Office of
6 Inspection and Enforcement has an inspection program. They
7 do not go out for the sole purpose of inspecting the case, but
8 in the course of doing other activities, inspecting fuel
9 cycle facilities or reactor plants, if transportation packages
10 are at the site they inspect them to determine if they're in
11 compliance with their certificate.
12 Q Am I correct, though, in understanding that there
13 is no requirement that these things be periodically re-
14 inspected; it's just simply an owner maintenance requirement,
15 he must keep it in compliance? Is that correct?
16 MR. HOEFLING: It's my understanding that the
17 certificate which imposes requirements imposes the requirement
18 that the equipment be periodically maintained. So there is a
19 requirement for periodic maintenance and periodic verification
20 of the characteristics.
21 MR. WILSON: Verification is what I'm after.
22 CHAIRMAN MILLER: How many such casks are in use
23 around the country? What are we talking about?
24 WITNESS HODGE: Did you ask how many?
25 CHAIRMAN MILLER: Yes.

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WITNESS HODGE: In the tens. We have six approved cask designs.

CHAIRMAN MILLER: I don't mean designs, I mean casks in being and being used for the purpose of transporting spent fuel.

WITNESS HODGE: I don't have the exact number with me. But it is in the order of ten.

CHAIRMAN MILLER: Could it be six?

WITNESS HODGE: Yes.

CHAIRMAN MILLER: Do any of you witnesses have particular knowledge or information, or would we have to look elsewhere within the NRC to get that?

WITNESS GLENN: That information was given in the testimony of Mr. Spitalni.

CHAIRMAN MILLER: I see. And he'll be testifying again?

WITNESS GLENN: He has already given it for the record.

CHAIRMAN MILLER: Very well.

MR. HOEFLING: I don't believe that's correct.

CHAIRMAN MILLER: Well, whether or not, he'll be testifying again, will he not, Counsel?

MR. HOEFLING: Yes.

CHAIRMAN MILLER: I think perhaps we had better leave it there, because I don't believe these witnesses would

wb6 1 have the direct knowledge that you seek. And we will ask
2 Counsel to see that Mr. Spitalni, or some other qualified
3 witness, does have the information, so it can be made part of
4 the record.
5 MR. WILSON: And, with that, I believe that's all
6 I have. Thank you.
7 CHAIRMAN MILLER: Thank you.
8 Any further questions?
9 DR. LUEBKE: Yes.
10 MR. MC GARRY: I have several.
11 CHAIRMAN MILLER: Very well.
12 Dr. Luebke.
13 DR. LUEBKE: I have some.
14 Back to the emergency response stage, it's very
15 good that the State is interested. And I would like to see
16 some means by which the Staff would introduce testimony,
17 either an amendment to the EIA, or whatever, with a statement
18 which clarifies whether it's Oak Ridge or Savannah River,
19 the site that would be called upon to come to the rescue,
20 and under what conditions this might be, like the second or
21 third fire alarm, like when the apartment building is burning.
22 Inother words, do you them right off, or do you go look at
23 the accident and see how bad it is and make a judgment and
24 then call in the emergency response team?
25 How is the DOE response to be coupled into the

wb7

1 operation? There's nothing in the testimony that I see, that
2 I have seen, prefiled, that speaks to this matter. And
3 before the end of the week I would like to see something.
4 CHAIRMAN MILLER: Mr. Hoefling, will you take care
5 of that matter?
6 MR. HOEFLING: Can any of these gentlemen respond
7 to that?
8 WITNESS GLENN: I have some familiarity with the
9 emergency response team in Region 8, the response team at
10 Hanford. I don't know that I can specifically answer all the
11 questions you have, but I do have information as to how that
12 particular response team is called out.
13 It consists of senior staff, mostly managerial
14 people who have come up through the ranks and who have
15 several years' experience in a vast number of fields. And
16 they're essentially on call at all times. And once an emer-
17 gency is demonstrated, at Hanford, anyway, they essentially
18 have the resources of the facility there, and anything that
19 they need.
20 I've been involved in a couple of responses. One
21 of them was an attempt to -- it was extortion. And we
22 responded to that with the various equipment that would be
23 needed to try to locate the material that was said to be
24 placed in a particular city in the region. And we were working
25 all hours of the night to do this.

We have mobile whole body counting facilities and various other things that are on call immediately. And we would essentially not hesitate to hop a plane and go anywhere that we were needed.

DR. LUEBKE: Then perhaps you'd be in a position to help Staff counsel frame a suitable statement that applies specifically to this route between Oconee and McGuire, so we'd have something tangible to work with.

WITNESS GLENN: As I stated, my information only refers to my first hand knowledge at Hanford.

DR. LUEBKE: But you could use a telephone or whatever and find out about Savannah River?

MR. HOEFLING: Dr. Luebke, I think we want an opportunity to work on that, rather than to take the time now.

DR. LUEBKE: No, I don't want to do it right now, this afternoon. But by the end of the week you ought to have something.

MR. HOEFLING: Fine.

CHAIRMAN MILLER: All right. Now who was next in line with one more question?

MR. MC GARRY: I have several questions.

I might say, we were having some trouble following the number that took quite a length of time to get out of the panel. And we just haven't been able to follow it, and we would like an opportunity to ask some questions.

wb9

I don't know how to best proceed, Mr. Chairman. I don't know if we could take a short three or four or five-minute recess and try to figure out the steps that one went through.

CHAIRMAN MILLER: We don't mind. We'd like to have the record adequate and complete. We don't mind if you want to do it that way. If you want to have these witnesses back first thing at eight o'clock in the morning, we can do it that way.

MR. MC GARRY: Tomorrow morning is fine.

CHAIRMAN MILLER: It will give you an opportunity over the night, and the witnesses--

Do the witnesses plan to be here anyway?

MR. HOEFLING: The witnesses plan to be here. And I think that would be appropriate.

CHAIRMAN MILLER: In that event perhaps we should recess. It's getting to be twenty after five. It'll give everybody a chance to regroup and read the transcript.

Let us, then, reconvene at eight o'clock in the morning, and the panel will be back at that time.

(Whereupon, at 5:20 p.m., the hearing in the above-entitled matter was recessed, to reconvene at 8:00 a.m., Tuesday, 26 June 1979.)