ORIGINAL

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of:

DUKE POWER COMPANY, et al

(Catawba Nuclear Station,
Units 1 & 2)

Docket No. 50-413 OL
50-414 OL

Location: Charlotte, N. C. Pages: 2232 - 2465

Date: Thursday, May 24, 1984

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY & LICENSING BOARD PANEL

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In the Matter of:

DUKE POWER COMPANY, et al., Docket No. 50-413-OL
50-414 OL

(Catawba Nuclear Station,
Units 1 and 2) ASLBP No. 81-463-06A OL

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BB&T Center, Fourth Floor
112 South Tyron Street
Charlotte, North Carolina

May 24, 1984

Hearing in the above-captioned matter was convened, pursuant to adjournment, at 9:00 a.m.

BEFORE:

MORTON B. MARGULIES, Chairman
Atomic Safety & Licensing Board Panel
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

FRANK F. HOOPER, Member
Atomic Safety & Licensing Board Panel
U. S. Nuclear Regulatory Commission
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Atomic Safety & Licensing Board Panel
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C O N T E N T S

(9:00 a.m.)

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

JUDGE MARGULIES: Please come to order. We will proceed with Interveners prefiled testimony on Contention 11.

MR. GUILD: Thank you, Mr. Chairman. Mr. Chairman, and members of the Board, this morning we have a panel of witnesses on Interveners Emergency Planning Contention 11, with respect to the extension of emergency planning for the City of Charlotte.

I would like to introduce beginning on my left, Mr. Jesse L. Riley, who I am sure you all know. Mr. Ray Twery, whose name has been misspelled on the prefiled testimony. It should be T-w-e-r-y. I apologize, Mr. Twery. And Mr. Steven Sholly.

Mr. Chairman, the witnesses are available to be sworn.

JUDGE MARGULIES: I will swear the witnesses. Will you please stand and raise your right hands.

Whereupon,

JESSE L. RILEY,

STEVEN C. SHOLLY,

- and -

RAY TWERY,

were called as witnesses on behalf of the Interveners and, having first been duly sworn, were examined and testified

as follows:

DIRECT EXAMINATION

BY MR. GUILD:

Q Gentlemen, do each of you have a copy of your prefiled testimony before you?

A (Witness Riley) Yes.

A (Witness Twery) Yes.

A (Witness Sholly) Yes.

Q Mr. Riley, do you have a document before you that is entitled, Testimony of Jesse L. Riley, with a date of April 16, 1984.

A (Witness Riley) I do.

Q And is that your prefiled testimony prepared by you for use in this proceeding?

A It is.

Q Do you adopt that as your testimony?

A With certain corrections, yes.

Q If I asked you those questions today, would your answers be as set forth in that testimony, with the corrections that you will make?

A They would be.

Q Would you go through and help us with the corrections, Mr. Riley?

A Yes. On page 2, fourth line from the bottom, instead of the word, 'minimum,' in the middle of the line,

it should read, 'minimal.' The following word is, 'and'. Insert 'the' before 24,000.

Q Read the phrase, please, as corrected.

A That line would then read: ..treatment would be minimal and the 24,000 fatalities.

Moving up on the same page, about seven lines, go to the word, 'anticipate.'

Q That is at the beginning of the line.

A Beginning of the line. It should be, 'anticipates,' not, 'anticipate.'

Q Add an 's.'

A Add an 's.'

MR. CARR: That is before 19,000?

WITNESS RILEY: Before 19,000. In the line before, there is a blank space at the end of the line. Insert, 'Table 5.12'

BY MR. GUILD: (Continuing)

Q Would you read that, please?

A Yes. Under these conditions, Table 5.12 anticipates 19,000, et cetera.

So you strike, 'I.'

A Strike whatever that letter is, yes.

Q All right. Is that clear, Mr. Chairman?

JUDGE MARGULIES: Yes.

BY MR. GUILD: (Continuing)

Q All right.

A Moving on to page 4, the tenth line from the top, starting at the line before it, to read the sentenee: One type is postulational, chances are one in two -- it reads, 'with.' Change it to, 'that.'

Q The line begins three types of probabilities?

A No. The line the correction is in begins with 'postulation.' Chances are one in two that a flipped coin.

Q Strike with, and insert, 'that?'

A That is correct. The ninth line from the bottom of the same page, the first word is, 'these.' The full sentence reads: It reflects on analysis and an estimate.

It should read: It reflects an, a-n analysis. The following line, you should see: reactor safety study capitalized.

On page 5, the first line reads: Similarly, the probabilities of Brown's Ferry, insert, 'the' before Brown's.

The ninth line down, reads: only 800 years or so reactor. The word should be, 'operating,' not 'operated' experien œ.

Four lines further down, the line begins: to time spans are available,; insert, 'no' before indication. So, that line should conclude: No indication has been given.

Two lines below that, starting after the first word, reads: Although death by vehicular accident, insert between, 'death' and 'by', 'of an individual.'

Please go to page 9. In the seventh line from the bottom, beginning with the word, 'instructions,' the line reads: instructions that they are given. Please strike, 'they.'

Page 10, at the end of the first paragraph, the line reads: wind speed and direction indicated. Put a comma in place of a period, and insert: to be given, period.

The seventh line from the bottom begins with the word, 'involved.' It should read: The All Hazards rather than, 'An all-hazards,' and of course, all-hazards should be capitalized.

On page 11, the ninth line from the top, reads: sequences of serious plant accidents result in the. Strike 'in,' which is the second word from the end of the line, and substitute, 'from.' Go down three lines, the first word is, 'majority.' majority of radio and television sets would not. Strike the, 'w' in 'would', and insert a, 'c', 'could not.' And the following line, substitute the word, 'operate' for 'play.'

Going on to page 12, line 5. It now reads, 'a likeliness of effective siren notification. Change the

first word, 'a', to 'the,' and change, 'likeliness' to 'likelihood.'

Going to the middle of the page, the line starting, 'shelter'. Shelter and tune to the EBS broadcast. Fairly. Please insert before, 'Fairly,' the word, 'the.'

Now go to page 14. And before the first sentence, insert these words: The simplest approach would be.

MR. CARR: That all comes before, 'Facilities'?

WITNESS RILEY: That is right. The simplest approach would be. And then strike, 'Facilities include.'

Going down to the third line, the last portion of which reads: The two systems under. Please strike the word, 'the,' at the beginning of the sentence. Capitalize the word, 'Two,' and between, 'Two' and 'systems,' insert 'more sophisticated.'

So that it reads: Two more sophisticated systems, strike, 'under,' and in the next line strike, 'consideration.' So the sentence would read: Two more sophisticated systems would be computer actuated.

The same line, the final three words, 'Up to a.' Please strike, 'a' and insert, 'the.'

Going down four more lines, the sentence begins: These messages could be taped or the specific.

Change the 'c' in 'could' to 'would.' It would read: These messages would be taped, and strike the 'the' before 'specific.'

In the following line, instructions would be pre-taped, strike the 'w' and insert a, 'c', to read: instructions could be pre-taped.

Going down to the fifth line from the bottom of the same page, the sentence reads: Yes. It would make clear which subsections should. Please add the word, 'be.'

The following line, the first word is, 'evacuate,' change it to, 'evacuated.' Add a, 'd.'

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The following line begins "and which", insert an "in" between "and" and "which", to read "and in which subsections." In between "subsections" and "should", insert "people", to read "and in which subsections people should shelter and for how long."

Turn please to Page 15. In the center of the page there is a line beginning "can be kept charged by the phone company's." Add these three words, "liquid", "fuel powered."

Q Where should we add that, Mr. Riley?

A Immediately after "company's" so that it will read "the phone company's liquid fuel powered generators."

Going to the next to the bottom line on the same page, the sentence which begins "Southern Bell's part of the system, I am told," strike the comma and insert "by their marketing people."

Q After "told?"

A After "told." So the sentence would read: "Southern Bell's part of the system, I am told by their marketing people, would cost about five point five million dollars."

Going to Page 16, the second line reads:

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"installed, it is estimated it would cost" strike the second "it" the one between "estimated" and "would" so that it reads: "is estimated it would cost."

Those are all the corrections.

Q All right. Now, Mr. Riley, as corrected do you adopt this as your testimony for use in this hearing?

A Yes.

Q Mr. Twery, do you have your prefiled testimony before you?

A (Witness Twery) I do.

Q And do you have any corrections to make to that testimony?

A Yes.

Q Would you do that, please?

A My name is spelled with one "r" instead of two. The correction is needed in the top of the first page.

The last line of the first page, the word "form" appears. It should be "from."

On the second page is a substantive correction. Towards the middle of the page, the line which begins, "receive" a percentage is shown as five percent. It

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should read "twenty point five percent."

MR. JOHNSON: Would you repeat that again?

WITNESS TWERY: Surely. In the middle of the second page, the line that begins "receive" the percent should be twenty and one half percent instead of five percent.

MR. JOHNSON: Twenty point five?

WITNESS TWERY: Those are the only corrections.

BY MR. GUILD: (Continuing)

Q Thank you, Mr. Twery. Was this testimony prepared by you or under your supervision for use in this proceeding?

A Yes, it was.

Q And, as corrected, do you adopt this as your testimony?

A I do.

Q Now, if I asked you these questions today would your answers be as set forth in this document?

A Yes.

Q Mr. Sholly, do you have a document before you entitled "Palmetto Alliance and Carolina Environmental Study Group Testimony of Steven C. Sholly on Emergency

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Planning Contention Number Eleven?"

A (Witness Sholly) Yes, I do.

Q Mr. Sholly, members of the Board, this is a separately bound document dated April 16, 1984.

A Yes, sir.

Q Was this prepared by you or under your supervision for use in this proceeding?

A Yes, it was.

Q Do you have any corrections to make to your testimony, Mr. Sholly?

A A few. On Page 3, in the answer to Question 5, second line, it reads "nuclear power reactors is to provide does savings." "Does" should --

Q Slow down one second and let counsel find this.

A Page 3, the second line of the response to Question 5, the word "does" should be "dose."

On Page 4, the seventh line of the response to Question 7, the word "exceeded" should be "exceeding."

Q Is that the line beginning "design basis?"

A That's correct. On Page 6, the last full paragraph on that page, the first word of the second

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sentence which is "possible" should be striken.

Q What line is that again, please?

A The second line of the last full paragraph begins "possible offsite doses." The word "possible" at the beginning of that line should be striken. It's rather redundant with possible ending the sentence.

On Page 7, at the bottom, the paragraph beginning "Obviously, these accumulated dose levels," the word "accumulated" should be striken.

On Page 13, the very first line, the word "hour" should be plural. It should read "roughly four hours of accident initiation."

On Page 16, the second paragraph in response to Question 18, the reference is the answer to Question 16. That should read "A.17" not "A.16."

And on Page 18, the second full paragraph which begins "This reservation aside" the last sentence of that paragraph now states, "Another way of stating this is that there is about one chance in five." That should be one chance in three. So it should be one chance in three to one chance in -- and instead of ten that should be five. So, as corrected, that sentence would read:

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"Another way of stating this is that there is about one chance in three to about one chance in ten of needing to implement protective actions beyond the present ten mile ..."

MR. CARR: Didn't you change ten to five?

WITNESS SHOLLY: Yes. Did I say ten? I didn't mean to.

That's all the corrections.

MR. GUILD: Is that last correction clear, gentlemen?

JUDGE MARGULIES: Yes.

BY MR. GUILD: (Continuing)

Q Mr. Sholly, as corrected, do you adopt this testimony for use in this proceeding?

A I do.

Q Gentlemen, I would like to ask you in turn to briefly summarize your testimony for us, beginning with you, Mr. Sholly.

JUDGE MARGULIES: Before you go into that, let's get the documents marked.

MR. GUILD: Mr. Chairman, the --

JUDGE MARGULIES: Are you marking these as

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two separate documents?

MR. GUILD: Yes, sir. If we could mark the first document, that is the prefiled testimony of Messrs. Riley and Twery as Intervenor Emergency Planning Exhibit 48.

MR. CARR: You are marking Riley and Twery together?

MR. GUILD: Yes. And that of Mr. Sholly that was separately bound, Intervenor's Emergency Planning Exhibit 49.

JUDGE MARGULIES: They will be so marked for identification with the changes made.

(The documents referred to above were marked Intervenor EP Exhibits 48 and 49 for identification.)

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Are you going to offer them?

MR. GUILD: Yes, sir. I will offer them at this time. We ask that they be received in evidence subject to examination of the other parties.

JUDGE MARGULIES: Is there any objection?

MR. MC GARRY: Your Honor, we are going to conduct voir dire and perhaps move to strike, depending

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on the answers. And then we have some substantive motions to strike the testimony, but it is recognized that we don't waive our rights in neither regard.

MR. JOHNSON: The Staff has some reservations about Mr. Riley's testimony. On Page 12, the two sentences that we would move to strike reference the CESG Survey that was striken from the testimony of Mr. Rutledge on May 11th. And additionally we would be wanting to voir dire on some other items.

So, except for those two we have no objection. If it is appropriate I would now move to strike those two sentences.

JUDGE MARGULIES: Could you tell us where they are again?

MR. JOHNSON: On Page 12, Line 8, starting with "The CESG survey," that sentence and the following sentence which ends "EBS broadcast." We so move it be consistent with the Order of the Board striking the survey in its conclusions and so forth from the testimony of Mr. Rutledge. And this is based on that survey.

MR. GUILD: Mr. Chairman, we maintain, of course, that the testimony with Mr. Rutledge and his

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survey should be received in evidence. It does seem to follow, as Mr. Johnson states, that for consistency it would be appropriate to strike these two sentences. We don't mean to waive our exceptions to the Board's previous ruling with respect to the substantive testimony of Mr. Rutledge.

But I think that Mr. Johnson's point is appropriate, given the Board's ruling.

JUDGE MARGULIES: These two sentences will be striken.

MR. GUILD: Mr. Chairman, if we may then, we would offer the prefiled testimony in evidence subject to the examination to come of the parties and a later motion to strike if they so choose.

JUDGE MARGULIES: Yes.

(The documents previously marked Intervenor's EP Exhibits 48 and 49 for identification are received in evidence.)

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BY MR. GUILD: (Continuing)

Q Now, gentlemen, in turn, Mr. Sholly, then Mr. Twery, and Mr. Riley, if you would briefly summarize your

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testimony --

JUDGE MARGULIES: There won't be any need for that, counsel. We have the testimony. We have all read the testimony and we will look to the testimony as it appears in the documents.

MR. GUILD: Mr. Chairman, with all due respect it would be helpful to those in attendance who have not had the privilege of having prefilings for a brief summary. And the witnesses are prepared for no more than a two minute summary of their testimony if the Chairman would entertain it.

We would ask the opportunity to do that.

JUDGE MARGULIES: Well, we are faced with time limits. And I'm going to maintain my ruling.

We have the testimony. I'm sure you have additional copies. If anyone of the spectators want to read it, they may do so.

MR. GUILD: All right, sir. We would -- since the Applicants have, and the Staff has, indicated their intention to voir dire the panel, we would either seek at this time to present examination with respect to the issue of qualifications or reserve our right to briefly

#2-11-SueT present a redirect voir dire on that subject, whatever the pleasure of the Chair is.

JUDGE MARGULIES: We will go to the voir dire and the motions. Go ahead, Mr. McGarry.

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

VOIR DIRE EXAMINATION

BY MR. MC GARRY:

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Q Mr. Riley, I will go with you first. This testimony, as I understand it, is being offered in support of Contention 11 and stands for the proposition that the EPZ should be extended out to an area of seventeen miles; is that correct?

A (Witness Riley) I would say that it should be extended. The form of the contention was determined by the Kelley hearing Board previously. Our contention had been that it should be extended into Charlotte.

Q And I guess the thrust of the question is, your testimony supports the proposition just articulated?

A That is correct.

Q We met on Decembet 12, 1983 when you testified on the reactor embrittlement issue. Do you recall that?

A I do.

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Q And, Mr. Riley, to speed up things, I'm looking at Transcript Page 11,905, and I asked you the question: Now, the various issues, and I won't belabor this point, but you have testified I believe you told me, on seismicity, radiological monitoring, ice condensers, technical qualifications, suspended solids, need for power, ATWS, stud bolts, QA, borate scaling, cask drop and health effects; isn't that correct.

And you responded: That is correct, and I will point out that in my professional work I have dealt with even more subjects than that.

Do you recall that?

A I do.

Q And the record will reflect that in addition to this list, you also testified on the issue of reactor embrittlement; is that correct?

A That is correct.

Q Now, I continue, on Page 3883 in the McGuire transcript, I have made reference to, I asked the following -- and let me see if this refreshes your recollection.

Let me ask you if you recollect this statement.

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MR. GUILD: Excuse me. I object. There is no need for counsel to read from the transcripts of prior voir dire in this very proceeding which then reads from transcripts of voir dire in prior proceedings. I don't think there is any dispute as to the record in either this proceeding or that proceeding.

If the Board is not going to allow a summary of testimony in the interest of time, it's certainly no need to have counsel for the Applicants reading prior transcripts. We concede the answers to the questions.

As in previous voir dire, they speak for themselves.

MR. MC GARRY: That's fine. I can just summarize that so the Board would have before them precisely the points.

MR. GUILD: Perhaps you could give the Board the transcripts, as the Board suggested I give the prefiled testimony to those who don't have it in front of them, Mr. McGarry.

JUDGE MARGULIES: It's not our policy to direct counsel how to conduct their cases, but if you can speed it up, counsel, it would be appreciated.

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MR. MC GARRY: Yes. I just have one page here, Mr. Chairman.

BY MR. MC GARRY: (Continuing)

Q Let me ask if you recollect this statement. I found in the McGuire proceedings -- this is you -- that I was under fire for claiming too broad a range of expertise because I testified in several areas. My testimony was striken, and one observation by the Chairman of the Board was the incredibility of a person having expertise in several areas. I tried to be cautious here as possible and claim as little as possible.

Then I asked you: Do you recollect that statement? And you said: It sounds like me. Do you recall that?

You responded: Yes, I do.

Again, are you familiar with that dialogue?

A I'm familiar with that.

Q And, Mr. Riley, I believe the record reflects in this case and other cases that you are a chemist and you have forty-five years of experience in the field of chemistry.

A I would like to correct that. I am a chemist

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and a physicist, and I've had the indicated number of years of experience.

And I would like to extend some of my response to the earlier question. In proceeding course, counsel who apparently are competent to deal with any area of inquiry, do so. I do not think counsel have some special sort of attribute that makes it exclusively their province to deal with a variety of problems.

I feel that in this matter I'm an interested person. I have been concerned about these nuclear plants from the day that I first knew they were constructed.

And the bottom line is that it becomes quite apparent that this plant will be licensed. And it will be operating. And under those circumstances, as simply an ordinary person with concerns about my life and health, the life and health of friends and family and others in this community, I feel that the least insurance we can get is an adequate emergency plan.

I feel I am fully qualified to address that subject.

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Q Now, with respect to that subject and the other subjects you testified to, am I correct in summarizing your involvement as a concerned citizen, who familiarizes himself with the literature, and draws conclusions on the basis of that literature, and brings that to the attention of the Board?

A That is in part true.

On the other hand, as a scientist I have developed a number of specialties as anybody in that field is likely to do. And I believe I have attained a satisficatory competence in many areas and that there is a reasonable chance that I have attained a comparable level of competence in the concerns for these proceedings.

Q Do you claim to have experience in emergency planning?

A I do not.

On the other hand, as a survivor, at my present age, I have had experiences in avoiding causes of injury.

Q Are you a health physicist?

A I am not.

Q Are you a medical doctor?

A Certainly not.

On the other hand, I am conversant with the literature of health physics, health consequences, as argued; and I could if called to do so ask other health physicists or

a doctor -- I am qualified to ask these questions.

Q And Mr. Riley, just for example, you make reference to a 19,000 fatality figure.

A That is correct.

Q Have you performed the analysis which gives rise to that number?

A I have examined in this proceeding Dr. Jacque Reed (phonetic) of the NRC Staff -- and he did perform that analysis. I have ascertained the details.

Q But in answer to my question, have you performed that analysis?

A I have not performed that analysis.

Q Are you a demographer?

A In a professional sense, I am not.

On the other hand, I am conversant as I have become acquainted with the materials and substance of demography, not only in this context but certainly in this context; yes, I've learned much about demography.

Q Are you a meteorologist?

A Similarly, I have briefed myself on this question. I have sailed over a number of years. I am familiar with weather patterns.

As a matter of fact, as long ago as in my twenties, I sailed the Atlantic from New York to Puerto Rico.

So I am quite weather-interested. And though I am

a professional meteorologist, I certainly have a high level of understanding of this area.

I have also visited the LAA (phonetic) and they were doing a research project on inversions in this area, which was part of the background in our case in this area.

Q And Mr. Twery is to your left?

A Yes.

Q He's a statistician. Are you a statistician in the sense that Mr. Twery is a statistician.

A Not in the sense that Dr. Twery is.

But in the sense that anybody practicing a physical science contemporaneously has to have a working functional knowledge of statistics.

And in response to this, some 25 years ago I was invited by the instructor in the Cellonese course in statistics to take some instruction.

Q Have you performed probabilistic risk assessments for Catawba or for any nuclear power plant?

A I have not.

Q Are you a behavioral scientist?

A In a professional sense, I certainly am not.

On the other hand, the question of psychology is of considerable interest to me. And so I have a double science major and a minor in math, I took courses in psychology.

Q Do you have any first-hand experience in how people are going to react in an emergency situation?

A Would you define what you mean by first-hand experience?

Q By way of background, you've been here at these hearings for the last 11 years; and you've heard Mr. Pugh (phonetic) and Mr. Broome, for example, testify about their experience in emergency responses, being on the scene, and being able to give expert testimony on how people are going to respond in an emergency.

Do you have similar expertise?

A No.

But I do have the observation --

COURT REPORTER: Dr. Riley, would you speak up, please, sir? I have trouble hearing when your voice is directed to the back of the room.

WITNESS RILEY: There's a new set of theories involved. The threat at this time doesn't give any olifactory signal, it doesn't give any visual signals and it doesn't give any auditory signals.

In terms of this threat I would expect the reaction of people to be different than it would be to a fire, which generates smoke which is visible and can be smelled.

BY MR. MC GARRY:

Q And the basis for your statement is your personal

opinion? Is that correct?

A I would say based on my years of experience, I woudl come to that conclusion; yes.

Q Are you an expert in evacuation time studies or transportation activities?

A No, I am not.

Q Are you a siren expert, an acoustical expert?

A I have have done some acoustic work. In my work at Cellonese we are intersted in ultrasonics. And toward that end acoustical equipment from a major manufacturing company in the United States and Denmark. And I performed sound spectra analyses and sound level analyses.

Q You heard Dr. Basione (phonetic) testify?

A Yes.

Q With respect to acoustical capabilities of the sirens?

Do you hold yourself out as possessing similar expertise?

A I would put it this way, Mr. McGarry:

If you will read my testimony in this matter you will find that Dr. Basione's testimony confirmed my allegations and my prior testimony in the contentions.

So, first of all, I do not make a living, as Dr. Basione does; but I believe that independently I arrived at the same conclusions as he did.

Q Would you answer my question? The question was: Do you hold yourself out as possessing the same expertise as Dr.1 Basione?

A I would hold myself out as possessing some reasonable proportion of the expertise that Dr. Basione has, but not as much.

Q Let me pursue that for a minute.

Your experience with acoustics at Cellonese fascinates me, quite frankly; because Cellonese, based on my entire examination of you by me, my impression was you worked on fabrics, polymers and are extremely knowledgeable in that area.

And I am quizzical in trying to grasp how acoustics enters in to the Cellonese product?

A I would be very glad to tell you.

Yarns go into making up fabrics --

Q Yarns?

A Yarns.

Fibers go into making up yarns. These fibers are made by the extrusion of a solution of polymer through small orifaces on the order of 40 microns.

Now, one of the besetting problems in fabrics is streakiness. And one of the question is, why are fabrics streaky; why do certain yarns dye differently than their neighbors do, or even undyed appear differently. The reason

happens to be an optical one.

Though the linear density of two yards may be similar, the configurations across them and tones are different. Now, since these are all nominally spun from circular jet holes, why are they different?

Well, it turns out there is a turbulence effect that occurs in these small orifices; and depending on whether there are small deposits inside this oriface which act as damping devices for the turbulent flow, one gets different levels of turbulence in different jet holes resulting in different configurations in the skin and filaments formed, resulting in the fabric complainkts that we receive.

Is that clear?

Q It is.

JUDGE MARGULIES: How does that go to acoustics, Mr. Riley?

WITNESS RILEY: The turbulence reveals itself by ultrasound, and by using appropriate sound equipment one analyzes the spectra and compare it to jets and so forth.

BY MR. MC GARRY:

Q Do you personally -- let me strike that question.

Is it Dr. Twery?

A (Witness Twery) No, sir.

MR. GUILD: Mr. Chairman, if I may -- if that concludes the voir dire of Mr. Riley, I would like an

opportunity to respond with some redirect questions. Perhaps it would be more convenient to do it at this point before you move to another witness.

MR. JOHNSON: Excuse me, Mr. Chairman, I would just like to make a few points about Mr. Riley; I think it would probably be better if I do it at this point?

JUDGE MARGULIES: Yes, please do.

MR. JOHNSON: Mr. McGarry really covered the two areas that I was going to focus in on. They are with respect to the answer to Question 11 on page 9 of the prefiled testimony of Mr. Riley.

Mr. Riley answer the question:. Are there obstacles to effective planning in this region? -- by saying,

There is a prospect of high traffic density and possible panic.

BY MR. JOHNSON:

Q You are not a traffic engineer, are you?

A (Witness Riley) I do drive an automobile, and I've been driving in Charlotte for the last 22 or 23 years; and I've had my problems just in ordinary traffic conditions.

From what we understand there will be much higher traffic density after the emergency broadcast system says there's been an accident at the Catawba plant.

Q And generally in regard to the reactions of the public, you are not a social psychologist; are you?

A I am not a social psychologist, but, on the other hand, I think it's part of human experience to have adult emotional upheavals oneself in traffic situations; you know how you react, and you know how they react. I don't think one has to be a social psychologist to realize that people will be very concerned if they were told that there was a highly nuclear cloud approaching them.

MR. JOHNSON: That concludes my voir dire questioning of Mr. Riley.

We would move to strike Answer 11 on the basis that his views are based on his personal knowledge as a member of the public and not as an expert in the areas in which he is testifying.

MR. GUILD: Mr. Chairman, I would like to respond to that; but if I may conduct a brief redirect examination on voir dire before I respond?

JUDGE MARGULIES: Yes, if you would do it briefly, please?

REDIRECT (VOIR DIRE) EXAMINATION

BY MR. GUILD:

Q Mr. Riley, have you served as the authorized representative for Carolina Environmental Study Group in this and other proceedings before the NRC and its predecessor, the Atomic Energy Commission?

A (Witness Riley) Yes.

Q And I believe your professional qualifications are in the record of this proceeding, so I won't go over those again.

JUDGE MARGULIES: I don't find them in the record.

MR. GUILD: Well, then, let me briefly summarize them.

They are in the record, Mr. Chairman. Mr. Riley has testified in this proceeding in the safety phase before Judge Kelley's panel; and his professional qualifications -- he's been received as an expert, a qualified expert -- and his professional qualifications are in the record.

I apologize they are not before this Board, but they are in the record. Let me summarize them briefly so that they'll be before the Board:

BY MR. GUILD:

Q Mr. Riley, do you hold any degrees from institutions of higher learning?

A (Witness Riley) I have a bachelor of science from Northwestern University, with honors degrees in chemistry and physics. I was in junior year phi beta cappa, senior year, senior psi representative. I have a master of science degree from the University of Chicago in physical organic chemistry.

Q And what has been your employment?

A My first employment was with Universal Oil Products Company. My second employment was with Shell Oil Company. My third employment was with Cellonese Corporation. I started, I believe, in 1944 and continued until my retirement in 1981.

Q And are you a consultant to Cellonese?

A I am presently a consultant to Cellonese.

Q In what capacity were you last employed?

A The job title was Senior Research Associate, before that I had been Staff Scientist.

Q And do you have any patents?

A Quite a number, I would say between 16 and 20.

Q In what general area are those patents?

A They are fairly broadspread, most of them, of course, are relating to the textile business; but some relate to color television.

Q In your capacity as a representative of a party in this proceeding and in others, have you familiarized yourself with studies of emergency planning for accidents at fixed nuclear facilities?

A I have read the documents in this case. I am sufficiently concerned about matters of emergency planning to go before the Mecklenburg County Commission and urge them to make a determination to be a participant in this proceeding. This was done last September.

The response of the County Commissioners, of whom there are five, was unanimously to adopt a motion to set up an Emergency Planning Review committee, the so-called "Blue Ribbon Committee," which was set up last October, appointed by the Chairman of the County Commission.

I have attended every meeting of this committee and I am listed as a resource person to this particular body.

In these proceedings I have had the opportunity to examine and study the emergency plans put forth by the State of North Carolina, York County in South Carolina; by the State of North Carolina, Mecklenburg County; Gaston County; I read Duke's plans in regard to Catawba site emergencies.

I would say that I am reasonably well-informed on the matter of emergency planning in this context.

Q Have you read the prefiled testimony in this proceedings by Applicants and the NRC Staff?

A I did.

Q And you actively attended and listened to the examination of the witnesses by Applicants and NRC Staff on cross-examination?

A I have.

Q Have you read the prefiled testimony in this proceeding by Applicant and NRC Staff?

A I did.

Q Have you actively attended, listened to the examination of the witnesses by Applicants and the NRC Staff on cross examination?

A I have.

Q Have you conducted such cross examination yourself?

A I have.

Q You have presented testimony before the Blue Ribbon Committee that you mentioned?

A I have. If there is any point, I have a copy of some of it with me.

Q Who were the other resource persons before that body? Was there a representative of Applicant's, Duke Power Company?

A Yes. Bill Carter was their representative.

Q And did Applicants present testimony before that body?

A They did.

Q And are you aware of the decision of that body to adopt a resolution recommending the proposal presented by yourself and Carolina Environmental Study Group.

MR. McGARRY: Objection. The question was asked whether or not Mr. Riley is aware of the results of the

Blue Ribbon Committee, and our objection goes to the point that such decision, or whatever it may be of that Committee, is irrelevant to this proceeding and is clearly irrelevant.

MR. GUILD: It obviously is not. What we predicted would happen yesterday, the Applicants obvious failure to recognize minimal parity in the offering of their supposed experts on these subjects, and the attacks that they make on the Interveners representatives obviously were lost on the Applicants. The point that is most germane to the question that is pending is that this very gentleman with his years of expertise and scientific disciplines on the subject of emergency planning presented testimony alongside the very best that Applicants could present to the local government study committee that reviewed this very question, and that local government study committee weighed the conflicting testimony of Duke's so-called experts and that of Mr. Riley and others, and adopted a resolution supporting the proposal of Mr. Riley.

Now, that should stand for a whole lot in terms of his relative qualifications to speak to this Atomic Safety and Licensing Board on the very same subject.

We maintain that 50-47 be the rule that applies in this case, which says specifically that the configuration extent of an plume exposure pathway EPZ is determined on the basis of local emergency response needs and capability.

Now, that is exactly what this gentleman speaks to. That is exactly what he spoke to when he presented testimony to the so-called Nurkin Committee, and that is exactly what their decision reflects, is a decision that in findings on the basis of such local emergency response needs and capabilities the present EPZ was inadequate to protect the citizens of Charlotte.

Mr. Riley is fully prepared, on the basis of his direct testimony, to stand cross examination on the merits of his opinion. Any questions that Mr. McGarry can ask him, that Mr. Johnson can ask him, that this Board can ask him, but I suggest that the issue of his qualifications is a red herring if there ever was one, and we should now get to the merits and let the gentleman speak to the subject.

JUDGE MARGULIES: We have heard enough on the issue of his qualifications. We are going to sustain the objection, and rule on the Motion to exclude Mr. Riley from the proceeding.

MR. McGARRY: Your Honor, while you are deliberating, one point. I have not formally moved to Strike Mr. Riley's testimony. You have anticipated correctly, I will move, but I would like to finish the Voie of all the witnesses before I make that Motion.

JUDGE MARGULIES: Judge Lazo indicates that I had made mention of sustaining the objection. If I

said sustain the objection, I misspoke. I was speaking in terms of ruling on the objection.

We seem to have been confusing the ruling. I sustain your objection to the last question, and that ruling stands. We are ready to rule on the qualifications of Mr. Riley to testify in this proceeding.

We would prefer to take up the qualifications of each witness separately, and if you are going to make a Motion, you may do so.

MR. McGARRY: Yes, Your Honor. We will do that briefly. Based on the answers to the questions that I asked and the Staff asked, what comes through is that Mr. Riley is a concerned citizen. He has been concerned about nuclear power for as long as I have personally been involved in representing Duke, and that is since 1972.

And he has testified on many issues. I maintain he has testified as a concerned citizen, not as an expert, and that is the key. It is a hard decision for the board. You are faced here with a gentleman who is concerned, and yet we do have rules, and we can look to Rule 702 of the Federal Rules of Evidence, and it is pretty straightforward, and one of the requirements of an expert -- we have some guidance, and that is the Appeal Board decision in McGuire. And in that case, I am referring to ALAB 669. In that case, Mr. Riley was not admitted as an expert. Was not

permitted to testify.

And the reasoning was, what Mr. Riley had done was he had surveyed the literature, and then he had formulated opinions and put them on a piece of paper, which served as his testimony.

The test of an expert is: Is that expert bringing some information that he or she alone possesses to this Board, to assist this Board as a trier of fact.

We submit that this Board is capable of reading the various documents that Mr. Riley has prepared and drawing its own conclusions. That is not expert testimony, and that is precisely the point that the Appeal Board ruled on.

I would just like to read from page 475 of the decision, which was found at 15 NRC 453, 1982. Rather, as presented in CESG's brief to us, his claimed expertise on the subjects at issue rest mainly on his asserted ability to understand and evaluate the matters of a technical nature due to his background of academic and practical training, and years of reading AEC and NRC documents.

Of all that was presented to the licensing board then, it cannot be said that Mr. Riley possesses any special knowledge, skill, experience, training, or education germane to the matters which his proposed testimony addressed.

Now, I think this Board is faced with the same proposition. One little byplay which was curious, is that

Mr. Riley said to me, well, Mr. McGarry -- when I asked him a question about fatalities -- you are as familiar with that as I am, and you could be sitting on the stand and I could ask you those questions, and you could give the answers.

That is probably true. Because I have been working in this field for some time. But I am not an expert. And that is the test that this Board has to come to grips with, so we move to strike his testimony because Mr. Riley is not competent as an expert to offer this testimony.

JUDGE MARGULIES: Does the Staff wish to be heard?

MR. JOHNSON: We have made our Motion. That is all I have to say.

MR. GUILD: Mr. Chairman --

MR. McGARRY: I am sorry. I asked numerous questions about his area of expertise, with respect to his being a scientist, with respect to demography, with respect to meteorology, and in each one of these instances Mr. Riley indicated that, no, he wasn't a professional meteorologist, no, he wasn't a professional demographer, and yet I can tell the Board the reason that we asked these questions, these are precise points in his testimony.

The Staff pointed out one specific, and that

had to do with behavioral science and traffic, but the entire testimony is rife with those types of opinions that we are prepared to go through, but we represent to the Board are contained in the documents.

And he just is not competent to give those types of opinions.

MR. GUILD: Mr. Chairman, I would like to be heard before the Board makes its decision.

JUDGE MARGULIES: We have heard enough on the issue, and we are going to issue our decision. We find that Mr. Riley is sufficiently qualified to testify in connection with Contention 11. He has demonstrated by his experience and by his participation in this proceeding his ability to testify on the issue involved.

As to the Motion to Strike of Staff, we consider that as part of his overall testimony, and the limitations that were pointed out in his background will go to the weight that we are to afford his testimony.

You will be permitted to testify, Mr. Riley.

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CROSS EXAMINATION

BY MR. McGARRY:

Q Is it Doctor Twery, or Mr. Twery?

A (Witness Twery) Mister.

Q I think Mr. Riley said Doctor Twery.

A I am all but dissertation, and was sometimes

referred to such since I am a university instructor.

Q I just want to give you due recognition, Mr. Twery.

A I don't have the union card.

Q Referring to your testimony, on page 1 you have a statement of your professional qualifications. I would like to inquire as to your work experience. I don't see that set forth.

Have you had prior emergency planning experience?

A My experience includes three years working for Stanford Research Institute, at the Combat Development Experimentation Center at Fort Ord, Monterey, California. Stanford Research provided a professional staff to assist the Army in evaluating new combat systems, new combat threats, which included the conduct of monitored, highly instrumented measured battalion-size, and slightly larger sized exercises, north of Monterey. To the extent that -- what trained units do in military situations, and when exposed to simulated nuclear rounds in combat, and to other threats such as state of the art ground and air stress, and seeing what units do do from monitoring radio communication and actual action lines.

To that extent, I have experience. As a consultant to social scientists in an academic-type of environment to try to study stress, I have some exposure to it. I do not

consider myself an expert in such.

Q As I understand it, you are being held out as an expert in the field of statistics, is that correct?

A I don't know what I am presumed to be. I am a concerned citizen who lives in the affected area, who has been trained in statistics, and has worked for over two dozen years in trying to apply statistics to the real world. Most of this time in an industrial-type environment. Most of this time as a person who has been either trying to model things statistically, or evaluate how well somebody else has done it, or to interpret figures from one of the sciences that statistics are used in.

Q You said in an industrial environment. Would you elaborate?

A Certainly. My experience overlaps with Mr. Riley's at Celenese, where for eleven years I served in various roles as an applied statistician, operations research analyst. Doing corporate consulting to the entire Celenese Corporation, all of the divisions. The models that we did were some simulation models applied to industry reaction and industrial models. Some were more applied science models, such as how will people build tires, and how will tires perform, to take one very simple kind of example.

I have also done sales forecasting, and also have

done interpretation of results from sample surveys, attempting to do what you would probably consider as market research type of information of both asking people questions, and analyzing both other primary and secondary data.

#5-1-SueT1

Q I'm sorry.

A I could go on, but when I say industrial, what I'm saying is commercial type decisions such as Duke's forecasting type problems with the type of things that I've done quite a bit of work on. Computer simulation, building models for what is going to happen to direct earnings as a result of technical restraints and market forces.

Q Let me see if I can shorten this.

A Certainly.

Q With respect to emergency plan, you made some reference to your experience working at the Stanford Research Institute. Is there any other job related experience that you would submit is germane to the issue of emergency planning?

A My work as a -- while I was at the University working for the Civil Engineering Department in the analysis of traffic flow as a statistical consultant might be considered germane. Some of the consulting that I've done to social psychologists might be considered marginal.

Q But with respect to your testimony, my

#5-2-SueT

understanding is you don't get into the issue of traffic flows or psychological stress; is that correct?

A It is implicit with the concern that led me to wish to testify.

Q I appreciate that. But your testimony appears to be taking certain data points from various treatises and then walking through a statistical or mathematical analysis to get a factor that you suggest people in your particular locale could be exposed to; isn't that correct?

A In general, yes. My reason for concern at the end is that looking at that factor and then asking the question, given that it may be higher -- risk might be higher by a couple of order of magnitudes as a practical matter compared to the theoretical statements that -- figures that are given in the two studies that I've looked at, my concern is whether the Sandia statement of roughly a factor of ten in casualties -- if you would allow me to use quotes around that -- might -- that casualties might be affected by more than the factor of ten in this particular environment. It's a question in my mind, not as an expert but only as a concerned citizen

#5-3-SueT

who is used to living in Charlotte.

But I do not purport to be an expert in emergency planning.

Q Now, Mr. Twery, with respect to statistics, again I've got a mind set and I think of you as a statistician, one who is a fascicle in working with numbers. When I say that, in my sense, it's nothing derrogatory about that. It was one of the most difficult courses that I had in college, so I appreciate what underlies that experience.

Can you explain to us what really a statistician does?

A A statistician can do anything that is within the realm of statistics. The realm of statistics consists basically of three -- the realm of statistics consists basically of three areas. One is called descriptive statistives; that is, how do you describe the world and how do you summarize the information that you have gathered into a form that is more readily understandable and more easily within one's kin. Secondly, the area of probability which discusses the area of, given a model how do you make estimates of the relative frequency with which

#5-4-SueT

various outcomes would occur, assuming that the model is correct. And, thirdly, the general area of inference which says that, given that I have looked at particular observations on the world or on an experiment, what are reasonably consistent models for me to say might describe the real world.

These techniques are put together by statisticians in many ways. Some people work in Washington just doing surveys which are intended to elicit the factual information that is required. Some of these people call themselves statisticians. Some people are mathematical statisticians and are concerned mostly with the problems of probability and inference from a theoretical mathematical point of view, or from a robustness point of view; that is, how sensitive are the mathematical results to conclusions to the deviations in the model in the real world.

And others -- and I think I will consider myself in this, in this last type, primarily others are applied statisticians and try to apply all three types of areas to particular applied problems. If somebody has a problem of what to do with numbers or how to get numbers

#5-5-SueT1

that will help them to reach a decision, I would certainly like to discuss things with them.

Q And in reaching a decision, a person such as yourself would put forth in a particular form the data in the most meaningful form, in the most representative form, of the real world situation; is that correct?

A One of the problems is to present data that is available in a meaningful form. Another is to discuss the possible impacts of deviations of the real world, possible deviations of the real world from the model that led to the conclusions, the standard statistical models.

And the third would be to apply the widest possible range of statistical knowledge and alternative techniques in order to get an answer which considering what the world is really like, what is the answer. We don't want to use a Philips screwdriver to turn a slotted-head screw, and that is often what a statistician calls a Type 3 error of using the wrong tool on the problem. It's a very common one and it's the type of error that I, as an applied statistician, am particularly sensitive to.

MR. MC GARRY: Thank you, Mr. Twery. We have

#5-6-SueT1

no further questions.

JUDGE MARGULIES: If you are ready to make a motion on his qualifications to testify, you should do so now.

MR. MC GARRY: We have no motion to make. We would turn to Mr. Sholly unless the Staff has questions. of Mr. Twery.

MR. JOHNSON: The Staff has no voir dire.

JUDGE MARGULIES: You may proceed.

BY MR. MC GARRY: (Continuing)

Q Mr. Sholly, you are next. How are you?

A (Witness Sholly) Okay.

Q Mr. Sholly, I think you have gotten a flavor of the type of questions I have been asking. And I'm sure you have been subjected to them in the past.

I want to turn first to your education and your experience. And, have you successfully completed any courses in the following subjects , nuclear engineering?

A No, sir.

Q Thermohydraulics?

A No, sir.

Q Atmospheric dispersion?

#5-7-SueT1

A Yes, in a meteorology course in college.

Q Was it a one-semester course?

A Yes.

Q What was the nature of the course?

A It was a meteorology course that is taken by earth-science majors primarily and approximately a third of the course dealt with atmospheric dispersion and its relationship to air pollution, and that was the context in which I studied atmospheric dispersion.

Q Radiation dosimetry?

A None.

Q I would like to focus on your work experience if I might. As I piece it together you graduated from college and then taught for two years, and then worked at a discharge facility?

A Waste water treatment plant.

Q Waste water treatment for about two years, and then became active in the Three Mile Island case?

A (Witness nodded in the affirmative.)

Q And after two years there, you moved to Washington and began working in 1981 for the Union of Concerned Scientists?

#5-8-SueT

A Yes.

Q Before I turn to your work at Three Mile Island and the Union of Concerned Scientists,, do you maintain that there is anything relevant in your background up until Three Mile Island that has a bearing on your testimony today?

A Well, the academic training in earth and space science includes some areas that are relevant in terms of atmospheric dispersion, geography in terms of examining demographic statistics and in some cases how the environment influences what goes on there, in terms of development of traffic patterns and such.

Also, my background was strongly general, mainly oriented at integrating information from various disciplines into a consistent analysis. And I think that's perhaps the most relevant part of it for consequent analysis and probabilistic risk assessment where it would be impossible for any one individual to have expertise if you are going to do a top to bottom probabilistic risk assessment, let's say, starting out with initiating events progressing through to core damage and through the environment to consequences, it would be

#5-9-SueT1

impossible for one person to have expertise in all the areas required to do the analysis. And as such, the person who is doing the model would have to rely on analysis by others and by some others, integrate that into the consequence analysis and explain how consequences would vary given different sorts of assumptions.

Q Just so the record is clear, you made reference to demography, meteorology and traffic flow, I believe. Do you hold yourself out as an expert in any of those disciplines?

A No. I have a working understanding of how they are interrelated in terms of my background geography in earth and space science, but I'm not an expert in each of those individual areas, certainly not.

Q You make reference in your testimony to various studies, the Reactor Safety Study, WASH 1400, the RSSMAP which we will call the Sequoyah RSSMAP, and these studies utilize various codes; isn't that correct?

A Yes.

Q I think you even reference one of the codes, or several of the codes, in your testimony?

A Uh-huh.

#5-10-ST

Q My question to you is, have you personally used the MARCH Code, the CORAL Code, the CRAC2 Code? Have you worked with those codes?

A In applying them, in other words, performing the actual analysis I have not had the opportunity to. The only one of which I would have used, as a practical matter, given the opportunity would have been the CRAC code. My background would not allow me to consequently run, say, the MARCH code or any of the PRA, thermo-hydraulics, I would not. I wouldn't even feel comfortable running those much less whether I'm qualified to or not.

Q Now, with respect to CRAC code, you feel more familiar with that, but I ask you the question, have you conducted any analysis?

A No. I think, given the opportunity to, I think I could competently do such an analysis.

Q You made reference to performing a consequence analysis and drawing upon analysis performed by others. And I get the impression it's a massive undertaking.

Have you personally conducted a consequence analysis?

A No.

#5-11-SueT

Q You are familiar -- could we just hold for a second? Could I have the Board's indulgence?

JUDGE MARGULIES: Sure.

(Pause.)

MR. MC GARRY: Thank you, Your Honor.

BY MR. MC GARRY: (Continuing)

Q Mr. Sholly, to sum it up, am I correct in my understanding of what you have done is not dissimilar from Mr. Riley has done, yet in a different area; that is, the -- let me characterize what I believe you have done.

You are concerned about various nuclear power issues. You familiarized yourself with those issues by reading the literature, by pouring over the literature, and then you draw upon the literature that you've read and reached various conclusions, some of which are set forth in this testimony today.

A That's in part. I have also been in contact and mostly simply a peer review meeting in Atlanta on NUREG 1050, the draft which deals with the status and use of probabilistic risk assessment at the NRC and I was a member of the panel on regulatory applications in that case.

#5-12-SueT

Q And what you bring to bear on, say, both of those contexts would be whatever knowledge you have accumulated based on your familiarization of the subject area by reading various treatises?

A Largely so, yes.

Q As opposed to hands-on performing those analyses, running those analyses, working with those codes?

A Yes. Most of what I have done with the Concerned Scientists anyway is analyzed the results of such studies to draw out technical policy implications of those studies and that worked on the basis of what I do in terms of comments on NRC rules in the area, advising citizen groups and local governments on emergency planning. That pretty well describes it.

Q And, again, the positions that you take for UCS or perhaps yourself and your comments to various citizen groups and jurisdictional groups and your comments to the NRC regarding various rulemaking or whatever NUREG documents, all of that is premised upon the knowledge that you have derived through reading the literature?

A Yes.

MR. MC GARRY: We have no further questions

#5-13-SueT1

for Mr. Sholly. Again, we would move to strike Mr. Sholly's testimony on the same basis of Mr. Riley.

We are all familiar with Mr. Sholly, and he has got a reputation in the industry that gave rise to what we refer to as the Sholly Amendments. But, in our view, Mr. Sholly has taken material, has read material, has gleaned from that material -- and the Board could do the same. And, so in our view, purusant to Rule 702 of the Rules of Evidence and the McGuire decision that I previously referenced, ALAP 669, we don't believe that Mr. Sholly possesses the expertise that is required to permit him to testify in this proceeding.

JUDGE MARGULIES: Does the Staff wish to make inquiry?

MR. JOHNSON: Just a second, Your Honor.

(Pause.)

No, Your Honor.

MR. GUILD: Mr. Chairman, I have no questions of Mr. Sholly, but with response to the Applicant's motion, I would say that Mr. Sholly's experience in the area -- it's obvious from his responses and from his visa attached to his testimony, he has provided testimony on the

#5-14-SueT

subject, analysis and testimony on the subject to a variety of bodies that have been decision-makers on emergency planning, committees in Congress and licensing boards of the Nuclear Regulatory Commission, and most recently in the United Kingdom on the subject of emergency planning for fixed nuclear facility.

The gentleman has studied the issue, and I think that his approach is directly analogous to the approach by Applicants, in the sense that Mr. Potter himself did not perform the analysis, either for example the Sequoyah RSSMAP but analyzed it, modified it, and drew conclusions and policy recommendations from it.

Similarly, he took Applicant's own McGuire analysis of what the effectiveness of hydrogen mitigation at the McGuire facilitiy similar to Catawba was. He didn't perform that analysis himself; looked at it, and thought it gave him some basis for supporting a notion of reducing the likelihood of more severe accident sequences, consequences, and presented those results to us in the form of his conclusions.

I think it no more denigrates the testimony of Mr. Potter to suggest his lack of expertise and

#5-15-Sue1T

qualifications or propriety in drawing on that literature than it does to suggest the impropriety or lack of qualification of Mr. Sholly to do likewise.

Again, we are troubled that Applicants don't seem to apply the same standards of expertise to their own people that they would have apply to those that criticize the adequacy of their facility and their emergency planning. We think Mr. Sholly's testimony is founded on sufficient qualifications to provide guidance to the Board.

I direct the Board's attention to the provisions of the Rules of Practice, 10 CFR 2733, with respect to the subject of examination by experts. The rules do not specifically speak to the question of qualification of an expert witness. We agree that by analogy the Federal rules of evidence are appropriate, although we think that the standard set forth in the Federal rules, contrary to that characterization by Mr. McGarry, is consistent with the provisions of 2733.

And there the language is relevant under Subsection A, is that the individual is qualified by scientific or technical training or experience to

#5-16-SueT

contribute to the development of an adequate decisional record in the proceeding.

That is in the context of conducting an examination, but I would submit that that is the same principle that play under the Federal rules, under the decisional authority, including the McGuire Appeal Board decision cited by Applicants with respect to Mr. Riley.

JUDGE MARGULIES: The Board is ready to rule. We find Mr. Sholly qualified to testify on Contention 11.

The motion of Applicants is overruled.

MR. GUILD: Mr. Chairman, before tendering the witnesses for cross-examination, I have one exhibit that I would like to have identified.

This is with respect to Mr. Riley's testimony, Page 13, Question 17. It is with regard to the alternative proposed alert notification system, and it is a mockup map of the City of Charlotte. I know Applicants have seen it before.

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DIRECT EXAMINATION

BY MR. GUILD:

Q Mr. Riley, can you identify that as a map reflecting your testimony?

#5-17-SueT1

A Yes. This map reflects my testimony. It shows in detail the system of subsectors with relationship to the Catawba plant that I propose to have specifically notified by telephoning system.

Q And does this graphically portray the alert and notification system that you described at Page 13 in response to Question 17 in your prefiled testimony?

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shows the city limit of Charlotte and it shows the lines proposed in the Board's writing of Contention 11 of the area subject to litigation.

Q All right.

That's the -- the dark line is Highway 16 and 74?

A That is correct.

MR. GUILD: Mr. Chairman, I would ask that this map, this document, be identified as Intervenors' Emergency Planning Exhibit No. 50 and received in evidence.

JUDGE MARGULIES: Is there any objection?

(No response)

JUDGE MARGULIES: It will be so marked and admitted into evidence.

(The document referred to was marked Intervenors' Exhibit EP 50 for identification, and was received in evidence.)

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MR. GUILD: Mr. Chairman, we tender the panel for cross-examination.

Gentlemen, please answer any questions by the other parties or by the Members of the Board.

JUDGE MARGULIES: Let's take a -- yes, counsel?

MR. MC GARRY: Your Honor, we have one matter that we might before you take a break put on the table; it's a motion to strike various parts of Mr. Riley's testimony.

And we will do it very quickly, and then break; it will take about five minutes?

JUDGE MARGULIES: Okay, let's go through it.

MR. MC GARRY: Okay, on page 2 --

MR. GUILD: Mr. Chairman, we would object.

The offered to strike all his testimony, and that motion was rejected. They don't get a second bite at the applie. We think it is improper and we would oppose that.

MR. MC GARRY: There are different grounds for that. The first ground was on the basis that he wasn't qualified as an expert to sponsor. Now in respect to specific sections we will maintain that it is irrelevant or already has been ruled-out by the Judge Kelley Board.

I would like to direct your attention to page 2 at the bottom --

MR. GUILD: Mr. Chairman, it's already been received. Applicants had the opportunity to do this. They have an opportunity through cross-examination to establish a foundation to strike. That's the process we've been following. If they have a preliminary objection, they should have made it in a timely fashion.

They didn't. And I would object to them proceeding this way at this time.

(The Board conferring.)

JUDGE MARGULIES: We will hear the objections.

MR. MC GARRY: Thank you, your Honor.

On page 2, the bottom of page 2, about the last eight lines, begins, "The 19,000 fatalities are conditioned on availability of moderate medical treatment."-- down to the end of the page; we move to strike that section, in that it raises a matter, that is, the adequacy of medi al treatment, that was rejected by the Safety Board.

And we have made reference to that on previous occasion; that was in a September 29th, 1982 Decision at page 5. In addition it is inconsistent with the Commission's ruling in San Onofre.

JUDGE MARGULIES: I think we ruled on a similar objection yesterday and in which we denied the objection, in that the matter for medical treatment was brought up in terms of establishing a number of fatalities rather than in terms of the adequacy of the medical treatment.

MR. MC GARRY: Your Honor, if you read the section it says, "As there are only 10 radiation beds in Charlotte, it seems that medical treatment would be minimum and 24,000 fatalities projected" et cetera.

It seems to question the adequacy of medical treatment. And they are able to go from 19,000 to 24,000; I think implicit in that jump is the adequacy of medical facilities. And that issue has been ruled-out.

JUDGE MARGULIES: I would make the same ruling

that we made yesterday and overrule the objection.

MR. MC GARRY: The bottom of page 5, Question 8; all of the answer to 8 we would move to strike as totally irrelevant to this proceeding; and this record should not be cluttered with references to Judge McMillan's decision which was overruled by the Supreme Court nine-to-zero.

MR. GUILD: May I be heard at this point, or should I wait till we go through all this again?

JUDGE MARGULIES: Let's hear it as he goes.

MR. MC GARRY: Page --

JUDGE MARGULIES: No, I want you to respond, Mr. Guild.

MR. GUILD: Mr. Chairman, the observation by Judge McMillan is of a lot of relevance.

Judge McMillan heard considerable evidence with respect to the issue of probability of accidents, and made factual findings that rejected Applicants', Duke Power Company's experts and their position, that you could dismiss the possibility of serious accident, death, and health effects as a matter of statistics.

While it is accurate to say that his legal decision declaring the Price-Anderson Act unconstitutional was reversed on appeal, the factual determinations that he made were not upset.

And it is the factual conclusions by informed

Charlotteans -- who happens to be a Federal District Judge -- who weighed all the evidence on this very issue; and it's a quotation from his opinion that specifically references core melt at McGuire or Catawba -- it speaks to Catawba -- and we think it's appropos, particularly -- it's not a matter in contest whether he said it or not; it's a publication of West Publishing Company; and we think it's appropriate to be presented.

(The Board conferring.)

JUDGE MARGULIES: In terms of the question: "Are there others who share your concerns?", the first setnence is responsive.

The remainder of that answer is irrelevant to the question; and it will be stricken.

MR. GUILD: Mr. Chairman, may we ask that this and any subsequent portions that are stricken be included in the record as an offer of proof?

JUDGE MARGULIES: The request is granted.

MR. MC GARRY: Turning to page 9, we support the Staff's motion to strike the answer to Question 11 for the reasons stated by the Staff.

JUDGE MARGULIES: We previously ruled on that objection. We will maintain that ruling.

The ruling was that we will permit the testimony and that the objection goes to the weight based on the

witness' qualifications.

MR. MC GARRY: Thank you, your Honor.

We then would turn to page 11, Answer 16, beginning with the second sentence, "The primary deficiency", the third sentence, and part of the fourth sentence up to the word "notification"; so, beginning with "The primary deficiency" and ending with "under such conditions there would be no notification". Then come down two more lines and we move to strike two words in the sentence that begins "There would be neither alterting" -- we would move to strike two words, "neither alerting"; and our basis is the language they make reference to questions the adequacy of the sirens to operate, the ability -- that power will be supplied to sirens.

This Board has already ruled that that matter is improper in this proceeding, and the Safety Board also ruled that this matter was inappropriate in this proceeding at transcript page 1089.

MR. GUILD: Mr. Chairman, it's a different context. There was no contention that's been allowed in to be litigated as to the loss of power to the siren system.

It is an obvious problem, though, in the context of using sirens as a means for notification to the City of Charlotte. It's a fact.

You can't just pretend the facts don't exist

because this Board or the NRC has chosen to dismiss contentions that raise troubling issues.

We think the fact is relevant, the fact that goes to the issue of what's appropriate alerting notification system for southwest Charlotte; that is in contention; and we believe that it underpins Mr. Riley's proffer of an alternative means of notification which is his computer telephone system. It's necessary for foundation.

(The Board conferring.)

JUDGE MARGULIES: We will deny the motion, but not consider the testimony as going to the merits as to whether AC power is or is not effective in operation of the sirens.

MR. MC GARRY: Thank you, Judge.

The next motion is on page 12, the middle of the page, being the word on the far right-hand side, "Fairly general information which would be required" -- all the way to the end of the page.

This language raises a new contention: the contention set forth in this language is the adequacy of the EBS message. That's a new contention. It has nothing to do with Contention 11.

And, further, it has nothing to do with any of the contentions. It's a new matter and should be stricken from this proceeding.

MR. GUILD: Mr. Chairman, the fundamental

distinction that gives rise to Contention 11 is that there are an awful lot more people in southwest Charlotte per area of land than there are in the EPZ, in excess of 2,000 persons per square mile.

The position of the Intervenors is that there are deficiencies providing a sufficiently precise instruction to those persons in the densely-populated southwest Charlotte area asthe use of a general EBS message that cannot be tailored as specifically as the telephone alerting system proposed by Mr. Riley -- and this goes specifically to that point.

The map that has now been received in evidence reflects the quadrants that the telephone notification system would be capable of directing a specific message to.

So these are facts. The observation with this about his opinion as to the inadequacy of the general EBS message to move persons out of the way of a plume in southwest Charlotte, or contrary, to order them to stay put in shelter while others move out of the way of the plume, have a basis; and should stand as support for his proposed alternative alert and notification system.

MR. JOHNSON: Mr. Margulies?

JUDGE MARGULIES: Yes?

MR. JOHNSON: Just a comment: even though the contention 11 raises the issue of what the size and

configuration of the EPZ ought to be, we don't believe it ipso facto raises every single substantive issue in the scope of Section 5047(b) and all the planning criteria.

And to the extent that this raises a substantive issue or that sort, I don't think it's appropriate.

MR. GUILD: Mr. Chairman?

JUDGE MARGULIES: Yes?

MR. GUILD: By way of response, Applicants' own pleading that's been received, been noticed, which identified the long list of specific enhancements that would be required in order to extend the EPZ, specifically mentions among many other things the EBS, the public information and education and the alerting notification system.

The contention does speak generally to the adequacy of emergency response; that's the point of having an EPZ, because it requires a detailed emergency response plan.

I think the confines of the substantive issues are reflected in the prefiled direct testimony. We're limited to what's before you by way of prefiled testimony. This certainly is one concrete aspect even the Applicants identify as would be required if the EPZ were changed.

JUDGE MARGULIES: Mr. Johnson's observation is meritorious. The contention only deals with the extension of the EPZ into a new area; it doesn't deal with the adequacy of implementing plan within the EPZ. And we would just treat

this as opinion testimony and not deal with it in terms of treating with the adequacy of the different systems that implement an evaucation of the EPZ.

MR.MC GURREN: Your Honor, as a point of clarification, does that mean that in writing findings we would not rely on this particular testimony in support of the contention, support of Contention 11?

MR. GUILD: Mr. Chairman, I'd like to be heard now that Mr. McGurren has had his opportunity to suggest what the confines of findings ought to be.

It's our view that Contention 11, which says that the EPZ is inappropriate, based on "local emergency response needs and capabilities," does require a foundation finding about the adequacy of local emergency response needs and capabilities; one of which is the capability for alert and notification.

And we would, of course, seek to offer evidence as we believe this is, as to the state of local emergency response capability in the City of Charlotte.

WITNESS RILEY: Judge Margulies?

JUDGE MARGULIES: Yes?

WITNESS RILEY: May I adopt my role as spokesperson for CESG?

(The Board conferring.)

JUDGE MARGULIES: I think it would be highly unusual

Mr. Riley, to be operating both in the fapacity as representative and witness simultaneously. And you have informed and able counsel in this joint contention.

Mr. McGurren, on your request for ruling, we reserve decision and will rule on it subsequently.

MR. MC GARRY: Your Honor, we have one last motion.

If you would turn to page 13, we would move to strike the answers to questions 17 through 25, which are pages 13 through three-quarters of page 16. That has to do with alternative system. We don't believe that alternative systems are within the scope of this contention.

It is our view the Contention 11 speaks to the issue of whether or not the emergency planning zone should be extended, and not, if it is extended, what types of response mechanisms should be considered by this Board.

JUDGE MARGULIES: In effect, it's an aspect of what Mr. McGurren's inquiry goes to?

MR. MC GARRY: That is correct, sir.

JUDGE MARGULIES: Mr. Guild?

MR. GUILD: Yes, Mr. Chairman, we think that at the appropriate time it will be for the parties to offer by way of remedy, proposed remedies to this Board, various defices to implement the results proposed in Contention 11, that is, the extension of the EPZ.

Beginning with the full extension of the EPZ planning provisions as reflected in substance in Applicants' pleading that's been admitted, the list of implementing measures, we think that there are various submeasures and phase procedures for implementing plans for Charlotte that can be considered as alternatives.

And we intend to propose these.

One of the proposals for remedial relief --

JUDGE MARGULIES: Well, let us not go into those.

MR. GUILD: -- is a method of alternative notification reflected in this part of the testimony.

You know, the Board is going to have to grapple with those questions, either on the question of the existing -- adequacy of existing capabilities, and response capabilities and needs, or remedial measures -- relief.

And one way or the other you're going to have to make a finding. We believe that this as alternatives goes to both issues: the existing state of needs and capabilities as well as remedial relief.

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Joefls

I am informed, for example, the Board struck -- while striking all of Mr. Rutledge's survey, included for example his proposed recommendations by way of an opinion as to what this Board should do to alter perceived inadequacies in the Plan, and this goes to the same thought.

JUDGE MARGULIES: It was a particular contention on that aspect. We will take a fifteen minute recess.

(Short recess taken.)

JUDGE MARGULIES: Back on the record. The Board has considered the Motions to strike that portion of Mr. Riley's testimony, beginning with Question 17 and extending to the end of Question 25, and it is the ruling of the Board to grant the Motion to strike the material contained therein, being beyond the scope of Contention 11.

In regard to your question, Mr. McGurren, all of those two sentences on page 12 are not striken. We will not have to consider them in the findings of the fact and conclusions of law that are submitted in this proceeding.

MR. GUILD: Which two sentences do you have reference to?

JUDGE MARGULIES: Starting midway on page 12, the fairly general information, which would be required in an EBS message, that sentence; and the following sentence.

MR. GUILD: May we have those portions of Mr.

Riley's testimony included in the record?

JUDGE MARGULIES: Yes. Is there any reason at this point not to accept into evidence the two exhibits, 48 and 49?

MR. McGURREN: No, Your Honor.

MR. McGARRY: No, Your Honor.

JUDGE MARGULIES: 48 and 49 are admitted into evidence. Interveners 48 and 49. You may proceed with cross examination.

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(Above referenced documents, Interveners Exhibits 48 and 49, are received into evidence.)

MR. McGARRY: Thank you, Your Honor.

BY MR. McGARRY: (Continuing)

Q Mr. Riley, turn to page 2 of your testimony. The second line of your testimony, you indicate lacking immediate protective action.

Am I correct in understanding that phrase to mean no protective action for a twenty-four hour period?

A (Witness Riley) That is correct.

Q Further on down through that paragraph, seven or eight lines down, Mr. Riley, you make reference to the Siting Guidance Study, NUREG/CR-2239. That is the Sandia Citing Study, is that correct?

A It is.

Q Have you used the Sandia Citing Study to assess the accident consequence of Catawba?

A I considered it as one of several accident assessment -- I considered it as one of several sources with respect to possible accident consequences. FES 0961 I believe I have also used.

Q Is it your understanding that the Sandia Citing Study used weather data from the Catawba site?

A Yes.

Q Mr. Riley, let me just hand you a copy of that document. Do you have a copy?

A I have a copy.

MR. GUILD: Could I perhaps look on with one of counsel's?

BY MR. McGARRY: (Continuing)

Q Page A-5. Do you have that, Mr. Riley?

A A-5. Yes, sir.

Yes, sir. Table 8.1-2, captioned General Site Data?

Q In the left hand column, they list there various plants, one of which being Catawba, correct?

A That is right.

Q And if we move over several columns, to a column there under the caption, Meteorological Station, it bears the title, Nashville, is that correct?

A That is correct. What is signifies is that typical meteorological years were used. In responding to your question, when I said, 'yes,' I had in mind the fact that the specific windrose data for Catawba is given, and I knew that the typical meteorological year data what they describe as several bins were used in their crank calculation.

COURT REPORTER: Mr. Riley could you please speak up. There is no sound system in here, and it is terribly difficult. It really is.

MR. McGARRY: Did you get the last --

COURT REPORTER: I got it.

JUDGE MARGULIES: Would it be better if Mr. Riley sat down at this end of the table.

COURT REPORTER: I think it probably would.

MR. McGARRY: Why don't we go off the record. Mr. Riley has all those documents he would probably like to move up.

JUDGE MARGULIES: I think we better clarify for the record as to how the time is going to be divided up today. The prior procedure, Interveners were getting four hours and fifteen minutes, and the other parties were getting an hour and a half, and then for Contention 1 and 7, you reversed that. I see no reason why we shouldn't proceed in the same manner today.

MR. McGARRY: That is what we are operating under, and we discussed the matter with the Staff. It might be helpful if we could ascertain how much time we have left.

JUDGE MARGULIES: As with yesterday, we did not take out time for Voir Dire. We only measured cross examination

MR. GUILD: I would like to say that the prior practice has been so zealously defended by Applicants in respect to time limits before the Safety Board included very, very, clearly, charging me with every minute I took during Voir Dire as part of cross examination.

JUDGE MARGULIES: We do not in this proceeding.

MR. GUILD: We ask specifically that the two hours that was taken to examine the gentlemen on the panel be charged against Applicants time on cross examination. It is only fair. That was what was charged against us in every case in the past.

JUDGE MARGULIES: What is fair is what we have done in this proceeding, Mr. Guild, and yesterday, when you took a half an hour Voir Dire, we did not charge you with it, and you got your full four hours and fifteen minutes, in addition to the half hour Voir Dire time.

MR. GUILD: I appreciate your courtesy Mr. Chairman in extending to us that half hour.

JUDGE MARGULIES: That is what you took in Voir Dire time. I couldn't give you more time.

MR. GUILD: No, you didn't. You cut off my time as a matter of fact. The point is, Voir Dire time was charged against us at every opportunity in the safety --

JUDGE MARGULIES: I have nothing more to do with the safety phase.

MR. GUILD: Fine, Judge. I would just like the record to reflect that this is a practice that has not been followed in prior parts of this proceeding.

JUDGE MARGULIES: You may continue.

BY MR. McGARRY: (Continuing)

Q Mr. Riley, I want to go back to the last answer. I asked you whether or not the Sandia Study utilized Catawa weather data. You indicated yes. Then I showed you the Sandia document, or asked you to examine it, and turn to pageA-5, and that indicated that the Catawba-Nashville meteorological data was used, is that correct?

A (Witness Riley) It was used in Crack 2. On the other hand, I do not have the information that would let me know what utilization was made of the windrose data.

Q Again, focusing on Sandia Citing Study, if you could turn to the Forward, page 3-iii.

A Roman 3.

Q Are you aware of the statements indicating that the primary focus of this document was to develop citing criteria, and that the results don't represent nuclear power risks?

A I have read that language, but I have also read, if you look at Roman 4, last paragraph: This report represents some work being done to support the expanding use of probabilistic risk assessment in the regulatory process. NRC must be careful with results of such analyses considering very large uncertainties in the results.

And then going on down, to the middle of the same paragraph: Results presented in this report are not significantly different than results of consequence studies that have been available in the open literature for decades. Given the source terms assumptions, large consequences are calculated.

However, the risk probabilities times consequences posed by such accidents are very small. Therefore, the accident numbers should only be quoted with the associated probabilities and with the stated assumptions recognizing the uncertainties in the analyses.

My reading of that, Mr. McGarry, was that the uncertainty level is such that the findings in this document would not be significantly different than those for a site specific study, such as the FES points out, that in their opinion the uncertainty level may be in the order of at least a factor ten, but probably not exceed the factor of one hundred.

Q And Mr. Riley, I would like to address your

attention to the last sentence of Roman 3.

Could you read that last sentence?

A Thus, the results presented in this report do not represent nuclear power risks; and when I read this Report, Mr. McGarry, I put a question mark after that particular sentence, because it seemed such an obvious non-sequetor.

Q Mr. Riley, again looking at the Citing Study, are you aware that the Citing Study assumes no emergency response beyond ten miles for twenty-four hours?

A Yes, quite a point is made of that, and the high levels of fatality and early illness that it reports are attributed to that.

Q Could you turn to page 2-51 of that document? I am looking at the carryover paragraph. Four lines from the bottom of that carryover paragraph, does not the document reflect the following language: It should be noted that most results presented in other sections of this report assume a no immediate emergency response beyond ten miles, and consequently a significantly over-estimated early fatality peaks.

A Is your question -- did you read it correctly? It is not my intention to hold you up, Mr. McGarry, but I am looking for another item in this report which I would like to include in my response.

MR. McGARRY: Your Honor, I am not going to make

a big point of it, but I think we should make it a rule that the witnesses don't confer.

MR. GUILD: If you have something to say to each other, please say it aloud so the reporter can get it on the record.

WITNESS RILEY: All right. Mr. Sholly asked me what I was looking for, and I told him that I was looking for material on the effects of emergency planning on these consequences.

He showed me a Table, Table 2.5-6 --

MR. McGARRY: What page is that on, Mr. Riley?

WITNESS RILEY: That is on page 2-47. What I was looking for, however, was a graph, which is also in the report, and which I have not yet found.

BY MR. McGARRY: (Continuing)

Q Perhaps your counsel can take that up on redirect so we can move on.

A (Witness Riley) The language is, as you say, correct. The point I want to make is fatality level is very dependent upon the emergency planning involved, and the figure when I locate it will show that there is a factor ten difference between no planning and no response, and best planning and best response in the judgment of the people who wrote this report.

And I would now like to indicate that the figure

that I was seeking is on page 2-71, and the scale -- there are five charts on this page -- and the chart in the upper left hand corner shows the relationship between mean early fatalities and reactor size, for no evacuation, summary evacuation, and best evacuation. By examining this chart one sees that the difference is approximately a factor ten between the two extremes.

Q Does that finish your testimony?

A It does.

Q Mr. Riley, turning to page 4 of your testimony, at the bottom of the page, you make reference to the Three Mile Island 2 accident, and you indicate that, as I understand it, the probability of that occurring was zero in the reactor safety study, is that correct?

A I would say rather it was out of the reactor safety study. There is no reference made to the sort of accident that occurred at TMI-2. It simply means that it hadn't been conceived of. Yet, the real world it happened, and it demonstrated that there could be such an accident.

Q Do you know if the reactor safety study considered a TMI-type sequence?

A In the sense that it considered operators throddling down the feedwater pumps, then turning them off, then turning them back on; in the sense that it considered a shock wave of water bursting the housing of a feedwater

pump, certainly not. It did not consider that sequence.

#8-1-Sue

Q Mr. Riley, let me show you a couple of documents. I will show it to your counsel first.

(Mr. McGarry is showing Mr. Guild a document.)

Mr. Riley, have you familiarized yourself with WASH 1400?

A (Witness Riley) I've read parts of 1400. It's a huge document and you can include the appendices. I have not read it from cover to cover.

Q Mr. Sholly, have you familiarized yourself with WASH 1400?

A (Witness Sholly) Parts of it. I've been through it all at one time or another.

Q Let me address you gentlemen's attention to WASH 1400 and its Appendix I, Appendix 1?

A Appendix 1.

Q Appendix 1 to that document. I'm looking at Page i-63 and there under the caption "Safety/Release Valve Reclose SR/VR", it describes that phenomena which would be in essence a stuck open PORV valve.

Would you concur?

A (Witness Riley) I have no problem with what

#8-2-SueT

you said but you do not address the additional features of the accident I mentioned, namely operator intervention and the failure of feedwater pump.

Q With respect to the feedwater pump, wouldn't that be the initiator, the initiating transient?

A It's a complex transient. In the early part of it, apparently there was improper performance of the ion exchanger. There was a clogging of a pipe which delivered ion exchange water to the steam generator from the ion exchanger.

And the clogging of that, due to apparently improper operation or design, I would say was an initiator.

Q As was the feedwater transient; isn't that correct?

A As was the mislabeling of the condition of the valves on the auxiliary unit.

Q Do you know if WASH 1400 considers operator error?

A I do not know the specific context of the TMI-2 accident, and in the cite you showed me earlier it did not.

#8-3-SueT

Q Do you know, Mr. Sholly?

A (Witness Sholly) Yes, it did.

Q Now, Mr. Riley, going over to Page 5 of your testimony, you make reference to the Brown's Ferry fire.

Do you know whether the Reactor Safety Study considered fire as an event that could lead to a core melt?

A (Witness Riley) I cannot say in my own knowledge that it did or did not. But I can say that it did not consider the specific sequence of events involved at Brown's Ferry involving the incredible situation that the polyeurethane foam material which was used to plug leaks in the cable trays had been accepted as nonflammable on the basis of standard tests made on a solid block of polyeurethane which when exposed to candle flame did not ignite.

Q Now, Mr. Riley, I would like to focus on your language on Page 5 where you state on Line 2 that the Brown's Ferry fire was unenvisaged and hence had a probability of zero.

Do you see that language?

A I certainly do. And what I mean by that

#8-4-SueT1

language is that the ignition mechanism was unenvisaged. The fire resulted from something that the operators of that plant and the Commission had failed totally to anticipate. So the probability was zero.

Q Mr. Riley and Mr. Sholly, I show you a copy of WASH 1400, and it's the Executive Summary. I'm sure both of you executives have read it; is that correct?

A Not for that reason. But, yes, I have read it.

Q And turn to Page 65. We have a section captioned "Other Internal Causes" and it's Section 5.3.5.

And I would like you to just peruse that if you are not already familiar with it.

MR. GUILD: Mr. Chairman, could I ask counsel to identify the date and the title of the document?

MR. MC GARRY: I'm sorry.

WITNESS RILEY: If counsel has no objection, I will be glad to do it for him.

MR. MC GARRY: I'm sorry. Yes, please, would you give us the date?

MR. RILEY: It's WASH 1400, NUREG 75/014. It's dated October 1975.

#8-5-SueT

BY MR. MC GARRY: (Continuing)

Q The question I have pending, gentlemen, is, do you know whether --

A I took you at your word, Mr. McGarry, to peruse this. Peruse means carefully and slowly. I'm still reading.

Q I just want to be sure you are aware of the question that is pending to help you in your thought process. Would you want me to?

A Please, yes.

Q The question is, would you know whether the Reactor Safety Study has considered fire as an event that could lead to a core melt?

A (Mr. Riley looks at document.)

The Reactor Safety Study was initiated for the Brown's Ferry fire. This document makes clear that the original concepts did not involve an anticipation of the Brown's Ferry fire. And the redirection in which the study proceeded was a consequence of this actual experience.

Q And then is it fair to say that the Reactor Safety Study recognized the Brown's Ferry fire and took

#8-6-SueT1

that into account in the language I've asked you to read?

A Yes, after it had happened, though the study was launched before that time.

Q Did Brown's Ferry result in a core melt, the Brown's Ferry fire?

A It did not, but I would like to point out that it very readily could have.

The Brown's Ferry fire lasted for approximately six hours. The individual whose candle flame ignited the polyeurethane foam insulation that had been stuffed in the cable trays to prevent air leakage into the low pressure MARK-1 containment, which is to operate at nine pounds absolute which is about five pounds below atmospheric pressure, instead of following standard operating procedures tried to put out the fire himself with a dry extinguisher.

He was aware that the regulations called for using dry extinguishers. After a while he notified not the proper source but someone who had gotten the proper source reviewing the fire emergency situation. For a period of almost six hours, the personnel at that plant

#8-7-SueT

battled to put out that fire by the prescribed methods which involved dry extinguishers.

Q Mr. Riley --

A During that period of time -- I would like to answer your question, if I may.

Q My question -- my time is running. My question is simple. Did the Brown's Ferry fire result in a core melt. The answer was no.

MR. GUILD: The witness has an opportunity to explain his answer.

MR. MC GARRY: He does. My time is running. If he has anything further, his counsel can bring it out on redirect. I'm not interested in the remainder of that answer.

MR. GUILD: I'm sure he's not, but the witness should have an opportunity to finish his answer, Mr. Chairman. My time is limited as well, and the witness should be able to give a complete answer to the question he has asked whether he likes the complete answer or not.

WITNESS RILEY: I could condense the answer, sir.

JUDGE MARGULIES: I'm going to sustain the

#8-8-SueT

objection. The answer went well beyond the question and was not a relevant response.

MR. GUILD: Mr. Chairman, we would like the response in full to be included in the record by way of an offer of proof. It should be understood that the answer was not complete as given, and we would like the complete answer in the record for consideration at least by the Appleam Board or the Commission or courts at some later time.

Can the witness be allowed to finish the answer for the record, please?

JUDGE MARGULIES: No. He cannot. You can state as to what he would testify to, which would be a full description of the accident. And we will let it go at that as the offer of proof.

MR. GUILD: At the next break, I will have the witness provide me that information and I will make a statement as to what his answer would be for the record.

BY MR. MC GARRY: (Continuing)

Q Mr. Riley, on Page 7 -- Page 5, I'm sorry, Page 5 of your testimony, you indicate that -- I can't put my finger on it right at this moment. Perhaps you

#8-9-SueT1

can help me. That various accidents were unenvisaged. You make reference to the Brown's Ferry fire, correct?

A That's right.

Q And the FERMI-1?

A Yes.

Q Are you aware that the Reactor Safety Study addressed the possibility in an event tree and labeled --

A In a what?

Q In an event tree.

A Event tree.

Q Are you familiar with that term?

A Certainly.

Q And labeled that possibility as an unanticipated transient?

A Are you referring to FERMI-1?

Q I'm referring to the fact whether or not WASH 1400 considered unanticipated transients in its analysis. Do you know?

A I would point out that FERMI-1 occurred in the 60s before the Reactor Safety Study was undertaken.

Q Again, I would like to direct your attention to WASH 1400, Appendix Roman I or I, and it would be --

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it will be Figure 1 4-11.

Again, directing your attention to WASH 1400, October 1975, Appendix I, we turn to a page. It says i 85-86. And we turn to Figure 1 4-11 and 1 4-12.

First, I would like you to read Note 4, could you, with respect to Figure 1 4-11?

A Figure 1 4-11(c) shows an arbitrarily chosen transient of some type that has not yet occurred in the one hundred fifty years of operation of commercial nuclear power plants.

MR. CARR: A hundred and fifty reactor years.

WITNESS RILEY: If I misspoke, a hundred and fifty reactor years is what it reads.

BY MR. MC GARRY: (Continuing)

Q And then on these pages, is it not correct, Mr. Riley, that there is a block, two blocks, and they contain event trees?

A That is correct.

Q And in the lefthand block, which would be Figure 1 4-11, in the bottom half, do we not have two event trees, one bears the caption "Part C, Upperbound Unanticipated Transient" and the bottom bears a caption

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"Part D, General Unanticipated Transients?"

A That is correct. Turn to my testimony --

Q I will get your explanation on Figure 1 4-12 and then you can.

At the bottom of that square, there is a caption "Part C, Unanticipated..." it appears to be Transient.

Does that appear to be what it says?

A That does appear to be what it says.

Q Now, would you please explain?

A Certainly. My testimony is before it happened the probability of a TMI-2 accident was zero. It had not been anticipated.

On the next page, my testimony is: Similarly, the probabilities of the Brown's Ferry fire, the FERMI-1 partial melt down were unenvisaged and hence had a probability of zero.

Now the verb form I use is a past tense. It's "were" and it means before the RSS came into existence. And at that time, these things certainly were not considered.

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I think it's also germane, Mr. McGarry, to look at the following sentence in which I state, "we simply have no knowledge of all possible scenarios which may lead to a serious release."

And you confirmed this.

"So it must be said that since the occurrence of the aforesaid events the Staff has greatly enlarged its contemplation of severe accident sequences."

Q Thank you.

Mr. Riley, turning to page 8 of your testimony, and you state therein that the people in southwest Charlotte most heavily contribute to estimated early fatalities?

A That is right.

Q What is the basis for that statement?

A The demography of the region, the fact that to get the high level consequences that are given in the FES, Table 5.11, Table 5.12, you'd have to have a lot of people, and you have to have the prevailing southwest wind.

Q Mr. Riley, those documents, the figures you've just referenced state that the early fatalities will be in areas such as Charlotte?

A They don't explicitly state it, but a reasonable person could draw no other conclusion from the other facts of record.

Q Mr. Twery?

A (Witness Twery) I was just going to comment I believe that the basis is, the assumption is made, that the population density assumed in order to get the figures arrived at -- were arrived at by assuming that there was a homogeneous distribution of all the people in a given disc centered on Catawba. That the number -- a large proportion of the people in that disc do live in the more populous areas of Charlotte, certainly in the area we're looking at, a large percentage of those. And in that sense, certainly, they do raise the average level of population per square mile throughout the disc that was considered.

Q Did you find any figures, any statement that specifically says that those early fatalities that you reference and Mr. Riley references, are attributable to people living in Charlotte?

A One of my objections that -- to -- or uneasiness about the conclusions is that the simplified assumption was made by the -- what's the green book's name? --

A (Witness Riley) Final Environmental Statement.

A (Witness Twery) Final Environmental Statement -- simplified things by not using census track data but, rather, using data for what the total population was within a -- within the disc.

Now, since they made that assumption, actually that's -- the part of the disc, one part of the disc that they

looked at that had the highest population density happens to be the part that we're talking about now, southwest Charlotte, or it has higher than average density.

I have not looked at the census track data, but I am sure that I have no doubt that that would substantiate the fact that the census tracks put it within the city limits of Charlotte in the 1980 census track data.

If there are any demographers present, perhaps they could comment.

Q My question is: is there any statement you rely on?

A Yes, sir.

The statement I relied upon was that they assumed a homogreneous density throughout the disc.

Q Is there a statement in that document, or any document, that says 19,000 fatalities that are references in your testimony and Mr. Riley's testimony, that are attributable in large measure to people living in Charlotte?

Do you find those specific words?

A Those specific words were not quoted in that, no, sir.

But it was based on population, obviously.

Q Mr. Riley, I ask you the same question?

A (Witness Riley) The words were not stated.

On the other hand, in response to an order by

Judge Kelley, demographic data were provided to the Board and the parties in respect to Charlotte.

And I have in front of me one of the exhibits that was then provided. I don't see the identifer upon it.

What it does is show the total population in various one-mile increments in the northeast, the east-northeast sectors.

And in order to get this sort of numbers like 40,000 people exposed to 200 rem or more, or 270,000 exposed to 25 rem or more, one absolutely has to use Charlotte demography.

It's an inescapable conclusion.

MR. GUILD: Mr. Chairman, the record should reflect that the document examined by the witness was a submission by Applicant as to demography in Charlotte.

BY MR. MC GARRY:

Q Mr. Riley, does the testimony reflect the evidence that there are approximately 95,000 people living in the EPZ?

A (Witness Riley) That is correct.

Q Doesn't the evidence also reflect that there is a transient population there?

A To a size like 35,000, that is correct.

Q And isn't it possible that the numbers that are referenced in the testimony, your testimony and Mr. Twery's

testimony, could take those figures into account?

A I don't believe it's possible.

In order to have that high a kill effect you'd have to have a concentrated plume. You get a concentrated plume, you would have to have conditions where there's an inversion, there's very little vertical circulation or turbulence in the plume region.

That automatically limits the plume width.

And an example of such a concentrated plume would be a width of degrees of arc of approximately 10 degrees of arc.

I can illustrate that to you by the diagram that I believe I have here.

(Pause)

Which is applied to Intervenors' Exhibit No. -- I believe -- is it 49 or 50?

MR. GUILD: The last exhibit, Mr. Chairman.

WITNESS RILEY: And when we apply this highly concentrated narrow plume to a map of the surroundings of the Catawba plant, it becomes apparent that to have the consequences that we talked about, you would have to have a highly concentrated population (demonstrating with map).

BY MR. MC GARRY:

Q Aren't there --

A (Witness Riley) From that we would not get

from the sources that you just referred to; of the 95,00 people that you speak of in the EPZ, 35,000 are at Rock Hill.

Rock Hill is in the diametrically opposite direction of Charlotte, and it wouldn't give us the sort of numbers of exposure that we would need.

If we wanted to try to involve Carolyn, again, we're off in a different angle.

And I don't think you can cover all the ground in the region with a plume which (demonstrating) at its 17 mile extent is only about two miles wide.

Q We have -- strike that question.

Are there not concentrations of people in the EPZ? Different concentrations?

A Can you put a number on that, Mr. McGarry?

Q Let me ask Mr. Twery, I see him nodding his head?

Can you do that, Mr. Twery?

A (Witness Twery) The population density in the EPZ is not homogeneous, is what I was nodding my head to; yes, sir.

Q Mr. Sholly?

A (Witness Sholly) I think the question can rather easily be resolved: at least in the Staff's calculations and also in the CRAC-2 calculations that went into the siting study, one of the features you hit on the printout is

the magnitude of the peak dose, the maximum calculated figure, and also an indication of what compass direction and distance segments the peak occurs in. And all that would be required is examination of the CRAC-2 output, the CRAC output in the Staff's calculations, and you could get that.

Q Mr. Riley, have you done that?

A (Witness Riley) I have not.

Q Mr. Twery, have you done that?

A (Witness Twery) No, sir.

A (Witness Sholly) One other --

Q Mr. Sholly, have you done that?

A No, I have not.

One other point, however, is characteristic of calculations using CRAC and CRAC-2, is that the large calculated consequences typically occur from a rain-out of the plume onto a densely populated area beyond 10 miles; in fact, typically between 10 and 25 miles.

Q After the population at 10 miles, 9 miles; that could be a contributor to this figure; is that correct?

A One could speculate, but it's much more direct to go with the CRAC or CRAC-2 outputs and take a look.

Q And are you aware that Rock Hill as Mr. Riley just made reference to runs from about 10 to 13 miles from the plant?

A I am aware of that, that it's a concentration of

population --

Q So isn't it possible --

A -- both cities, I am sure, would show up on the CCDF curve, the curve that plots the cumulative distribution of effects, where they would really turn up.

A (Witness Riley) Mr. McGarry, to elaborate on that, to be specific what you seem to be interested in is "b". We consider the most populous sector, which is the northeast sector, you see that between 10 and 11 miles the population is about 1,600.

I've indicated that the intense plume that we are discussing would be about a quarter of that in terms of degree or arc. So that gives us 400.

Let's take the next one, that gives us a little over 2,000.

Add 500 to it and we've got 900.

We get up to 4,500 in the next one-mile increment and that gives us 1,000.

What I am pointing out is that by this procedure we can head to a high value. There is no other population distribution about the Catawba plant that will give you these sorts of numbers.

Q Thank you, Mr. Riley.

MR. MC GARRY: I want to show counsel a letter here.

(Pause)

BY MR. MC GARRY:

Q With regard to the Sandia siting study, I'd ask this of Mr. Sholly and Mr. Riley -- I suspect, Mr. Sholly, you are familiar with this:

That a Mr. Willian Snyder, Director for Nuclear Fuel Cycle Programs, Sandia Labs, wrote a letter to Chairman Palladino dated November 12, 1982; and it was with regard to, I believe, comments of the Washington Post and a letter, the Marquis letter, Congressman Marquis letter, and comments that appeared in his committee.

Are you familiar with that letter, Mr. Sholly?

A (Witness Sholly) I have not seen it. I think I've seen the other letter.

(Counsel handing document to witness.)

A I have seen this one.

Q There are two letters: one went to Carl Walsky (phonetic) of AIF, and one went to Chairman Palladino; and they are identical letters.

And you've seen one of those letters, Mr. Sholly?

A Yes.

Q Mr. Riley, have you?

A (Witness Riley) Yes.

Q I just direct your attention to the third paragraph. Am I correct, it is stating that -- this letter states that,

"Information generated in our study should not be employed to evaluate risk or accident consequences for actual operating plants at US sites."

Is that correct?

A That is the language.

And my observation about it is that the nuclear industry and the NRC were damaged very considerably by the release on the stationery of the Committee on Interior and Insular Affairs of the United States House of Representatives, of the peak fatalities that were found to have emerged in the Sandia study.

And I point out that this is dated November 1, before the letter to which you referred.

And I would say that the letter is in response to you might say the fire that was started by this particular revelation and that -- Mr. McGarry?

Q Go ahead, I don't mean to cut you off; I just was going to confirm your point for the record.

A By the fire that was set up by this particular revelation.

I am regretful to say that in practice in governments in the United States very frequently we see statements that are very clearly self-serving and which ignore the palpable truth.

I said earlier in my testimony that the gentleman

who signed-off the foreword of the technical guidance pointed out there were no significant differences in any of these groups of numbers. And now to put in the disclaimer that it wasn't calculated for that specific purpose is an absurdity.

Two-and-two make four whether or not I've got a contract to a certain person for saying that in a certain context.

Q Just so the record is complete, let me read the first two paragraphs; I think it corresponds to what you said.

This letter, written by Mr. Snyder to Chairman Palladino, begins:

"On behalf of Sandia National Laboratories, I wish to correct impressions left by the Washington Post articles and subsequent wire service reports on reactor accident consequences.

"These reports seriously misinterpret our draft reports and other preliminary information. The net result is that the public has been given a very distorted and confusing picture of nuclear power reactor accident probabilities and consequences."

A That is Mr. Snyder's opinion.

MR. MC GARRY: Your Honor, may I put these in the record because they have been identified as documents; we have copies for the Board and parties.

I would ask that the November 12, 1982 letter from A. William Snyder, four pages in length, be marked for identification as Applicant's Exhibit EP 20, and be received in evidence.

JUDGE MARGULIES: You haven't distributed copies.

(Mr. McGarry distributing copies of document to Board and parties.)

MR. GUILD: Mr. Chairman?

JUDGE MARGULIES: Yes?

MR. GUILD: We -- my copy is rather poor; I wonder if Applicants have a better copy so I can identify the identity of Mr. Snyder, the author of the letter?

MR. MC GARRY: Yes, I have a clearer copy which -- it's on the letter to Mr. Walsky, which indicates A. William Snyder, Director, Nuclear Fuel Cycle Program; and it's blurred in the copy that I've asked to be marked for identification as Exhibit EP 20.

MR. GUILD: Mr. Chairman, we object to receipt of this letter in evidence.

The letter appears to address a document that is not the basis for Mr. Riley's testimony, and that is the draft report and other preliminary information; that's the language of the second paragraph of the letter.

I note that Mr. Riley's testimony explicitly has reference to NUREG CR 2239, which is the study itself

in its final form.

I think the colloquy that Mr. Riley had with Mr. McGarry on this point reflects that it's addressed to a press report that commented on a draft, total fatality figures, if you will, that were not within the specific context of the way this witness says he relied upon the data and analysis in the actual final report as it applies to Catawba and emergency planning in Contention 11.

So we would object on relevance grounds to redeipt of the letter.

I would also mention that Mr. Snyder is obviously not available; and so his connection with the study itself and how much knowledge he has of the details of the final report is unknown. But I don't mean to hinge my objection on the technical question of authorship of the letter. I am simply concerned about whether the substance of the letter speaks to the same, the same matter that Mr. Riley does in his testimony.

MR. JOHNSON: I think it is fair game, this letter. Mr. Riley's testimony with regard to some of the peak numbers is in fact based on the information that's in that press report in the Washington Post, and the 42,000 fatalities, for example, on page 3 of Mr. Riley's testimony aren't found in the Sandia report at all.

And therefore I think it's legitimate, this letter

which comments on the Washington Post and wire services reports addressing the information upon which Mr. Riley is relying.

JUDGE MARGULIES: Mr. McGarry?

MR. MC GARRY: Yes, your Honor.

We subscribe to the Staff's position.

In addition, both witnesses when handed the document indicated that they were familiar with the document; it's not a new document to them.

And Mr. Riley I believe referenced that document in cross-examination yesterday with respect to interrogation of our witnesses.

WITNESS RILEY: I didn't reference the Snyder document. I referenced the Subcommittee on Oversight and Investigations' document.

MR. MC GARRY: And this letter is part of the entire package of that subject; and inasmuch as that subject has been introduced in this record, we think that it is appropriate that this document should be part of the record. We would note it comes from the Commission's files.

MR. GUILD: Mr. Chairman, Mr. Riley's reference at page 3 is really not to the Washington Post or wire service reports, as Mr. Johnson suggests; it's to the Report of the Committee on Interior and Insular Affairs, Subcommittee on Oversight and Investigation, November 1, 1982.

MR. MC GARRY: And I believe the witnesses, when I asked the question, acknowledged the committee report gave rise to the Washington Post and wire service articles.

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MR. GUILD: Mr. Riley's reference to Page 3 is clearly not to the Washington Post, the wire service reports, as Mr. Johnson suggested, it is to the Report of the Committee on Interior Insular Affairs, Oversight Investigation, November 1, 1982.

MR. McGARRY: And I believe when the witness, when I asked the question, acknowledged that that Committee Report gave rise to the Washington Post and wire service articles.

MR. GUILD: I am sure the chicken and egg sequences could extend quite far, Mr. Chairman, with respect to what was connected to what. But the point is the letter addresses not NUREG 2239, nor does it address the Committee of Congress, it addresses something different. It's author is not present and available for explanation of what it does address, or for response to questions on cross examination, and we object to its receipt.

JUDGE MARGULIES: The Board will admit the letter into evidence, but not to the truth of the matter as recited.

BY MR. McGARRY: (Continuing)

Q Mr. Twery?

A Yes, sir.

Q Turning to your testimony, do you have it before you?

A Yes.

Q Page 2. You indicate at line 13 of your testimony, that the expected value of .176 early fatalities from the operation of Catawba Units 1 and 2 over their operating lifetimes, is that correct?

A That is what I intended to reference, yes.

Q Does this value come from the NUREG 0921, which is the Final Environmental Impact Statement?

A It was my intention to take the correct figures from that, yes, sir.

Q Is this value all the sectors and all the distances?

A There is no reference to sector. It is the average value. I presume. It is not stated. And given this out in the context to which I can only conclude it was an expected value.

Q It is an expected value for all fatalities in all sectors?

A For all of the simulation cases that they ran, I presume, over all conditions, yes. Averaging over all conditions.

Q And over all sectors?

A Sure. South, north, east, west, for example.

Q You indicate further down in your testimony that -- you have a value of .35 for your sector of early

fatalities, do you see that?

A .176 becomes .035.

Q And then eventually becomes .35 for my sector; you say, accordingly the .035 becomes .350 for my sector.

A Yes.

Q I find that rather curious. If for the totality of the environmental consideration, the early fatality figure is .176, and for your sector, which is only a part of the whole, the early fatality figure is greater. How can --

A You are comparing an expected value with a conditional expected value. The expected value is for the entire area. If I chose a random place to live, in any direction from the Catawba plant, then the expected value would be .022.

If I say that I live in a specific spot, and I ask the question for the particular 22 and a half degree sector that I live in, what is my risk, given that fact that I live where I am as the condition, then the expected value is quite different, and I as a resident of a particular house in a particular location that I own and that I am not going to move from, was particularly interested in what is risk that I have? How much do I have to worry at night? Or during the day.

Q What do you mean by the term, 'expected value?'

A You want me to take up your time to answer that? Expected value, I mean a mathematical expectation in which each possibility is weighted by the probability with which it occurs. By conditional expected value, it is essentially the same thing, except that you are given a fact, and you take the expectations. That is, you use conditional probabilities instead of unconditional probabilities to do the averaging with.

Q You have a value here of .0022, and you describe this as an expected value. How did you calculate .0022?

A I would have to find it in the table. I thought I took the right one out. Perhaps you can point out that it is wrong, I don't know. What is the expected value.

MR. JOHNSON: Do you want to use my document?

WITNESS TWERY: Perhaps you can tell me what the right figure would have been used to take out of here.

MR. RILEY: I can offer it to the witness. It is Table 5.13. I believe that is the number you used.

WITNESS TWERY: I believe that -- I will attest to the fact that was I was trying to do as just a poor person who was living there, and trying to see what the technical documents available would likely shed on what my risks was, that I did not do the detailed analysis that I am sure the REC Committee would do if they had to substantiate such a thing.

What I did, was I used the figure of 22,000 that appears on page 580, on the line that is titled 10 to the minus 7, and ignored the probabilities of any contribution to the expected values that would be made by other --

Q Okay. We are looking at a different table.

MR. CARR: The problem is you are using the Draft Environmental Statement, and this is the Final.

WITNESS TWERY: As an informed citizen, I find it impossible to get a copy of the final document, I am sorry to say, so I just used the best that I had.

BY MR. McGARRY: (Continuing)

Q You just take your time.

A Page 581, I believe, the same Table, Table 5.11, probability of impact per reactor year at various levels, I looked only at the probability line for ten to the minus 7. The figure that is given in this table, in the column Persons Exposed over 200 rem, is 22,000. Multiply the 22,000 by the probability, ten to the minus 7, I got .022. The expected value actually would have to be obtained by taking the cross products between the first and the second column for all lines, and added together, .0022 is actually an underestimate of the expected value as I interpret the table.

If I took the wrong one, I certainly stand to be corrected.

Q So, this is an approximation of the expected value?

A Pardon me, sir, it is the lower bound of what the expected value is.

Q It is the lower bound of the expected value for persons exposed over 200 rem.

A Yes, sir.

Q Is it your understanding that a person exposed to over 200 rem is a fatality?

A No, sir. It is something I wouldn't like to have myself, and I was going to look into this on my own. If I used the word, 'fatality' there, I am sorry. Perhaps I am not using the correct technical terms.

Q I believe your entire testimony speaks to fatalities. It states right here that the expected value .0022 for early fatalities, and then you continue building on that .0022.

A I use that as a starting point. The argument would be the same. If my figures are wrong, sir, I certainly would appreciate the right figure that I should use.

Q I am quibbling now, sir, with the word, because then I come over to page 3, and the top of page 3, line 3, you conclude between 35 and 350 early early fatalities.

A Early -- you are saying that I should have said they are over 200 rem, immediate exposure.

Q Yes. Would you accept that?

A Yes, sir. The important thing to me was as I read the draft report and read and looked at the Sandia Study, was that the risk to me -- I was trying to evaluate was there any risk that I would be concerned with as a resident of the area, and I tried to lay out here just the sense in which the risk to me is larger than might be implied by the figures that are presented in the Catawba Study.

A (Witness Riley) I would like to add for Mr. Twery's information, that 200 rem is a threshold level for early fatalities. Depending on medical treatment, it is near at the fifty percent level dosage -- I believe 314 rem; if there is heroic medical treatment, it is a little over 500.

A (Witness Twery) So, I would be sick, but not necessarily dead.

A (Witness Riley) You would have a chance of dying.

Q Mr. Twery, turning to another topic, you indicate in the testimony that you live at 3335 Sunny Brook Avenue?

A (Witness Twery) Drive, sir.

Q Drive. And do we have a map that reflects precisely where that is?

A That is approximately three-quarters of a mile from South Park.

Q I am sorry. How far sir?

A Approximately three-quarters of a mile from South Park, sir.

Q If we may have the Board's indulgence for a moment.

JUDGE MARGULIES: Yes, you may.

(Off the record discussion among counsel)

MR. McGARRY: We are just trying to identi ' off the record precisely where Mr. Twery lives, and we will put it on the record.

JUDGE MARGULIES: Is there any objection?

MR. McGARRY: I am sorry?

JUDGE MARGULIES: Is there any objection to Mr. Guild conferring with Mr. Twery?

MR. McGARRY: I think it is highly unusual, Your Honor. No problem. I would say there would be no problem.

WITNESS TWERY: Let me just take one half a minute.

(Witness confers with Mr. Guild)

JUDGE MARGULIES: You may proceed.

MR. McGARRY: (Continuing)

Q I feel like the mouse that roared, Mr. Twery, but to pinpoint where you live, I show you a map which I believe is Intervener Exhibit, and would it be safe to say that on this exhibit --

A (Witness Twery) That looks about right.

Q And that would be east-northeast sector, and it would be -- it is almost in the middle of the page, is it not.

A I am not sure what you mean by, 'page.'

Q This exhibit.

MR. GUILD: There are some numbers and letters in those things. Do you see those.

MR. McGARRY: Can you help me, Mr. Guild, to identify what exhibit --

MR. GUILD: This is Interveners 44.

JUDGE MARGULIES: Is it 44 or 50?

MR. GUILD: 44 is the unmarked version. Maybe it would be clear to use --

JUDGE MARGULIES: That is 50.

MR. McGARRY: Interveners EP Exhibit 50.

MR. GUILD: They are identical maps. One has markings.

MR. McGARRY: And we are looking in the east-northeast sector. We come down to the east-northeast to where it says. It appears to be 16C. We see the word, 'Charlotte' in the middle of the map. We come directly down below the 'C', and we see the number 16, and then in the bottom lefthand square, that would be 16C, and at the very top of that square, and almost in the middle, there

is a number 3667, and right below it is the word, 'road.'

In that triangular area, that is where Mr. Twery lives, correct?

WITNESS TWERY: Yes, sir. That is within a quarter of a mile of it.

BY MR. McGURRY: (Continuing)

Q Thank you, Mr. Twery.

A (Witness Twery) Surely. It is always nice to know where I am.

Q Mr. Twery, just so the record is correct, I believe you said you lived about a dozen miles, and I believe that map reflects that you live about fourteen miles from the plant. Will you accept that?

A Certainly.

Q Now, going down to page 2 of your testimony, you indicate there in the middle of the page that you are in a 22 and a half sector. That is east-northeast sector, correct?

A Yes, sir.

Q Which would receive a plume from the Catawba unit about five percent of the time, and you correct your testimony to twenty point five percent of the time.

A Yes, sir. Did I get the right sector?

Q Nope.

A Am I off by one sector?

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Q Yes.

A It should be what -- eight, nine percent.

Q Let me show you --

A Could I ask you what the statistical competence, the standard deviation is that is associated with any of the numbers that you are about to show me?

Q No, you cannot.

A Excuse me, sir.

Q As I said to the Board today, I am not an expert. Mr. Guild, I will show you these in one minute. Let me show them to counsel first.

End 10

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JUDGE MARGULIES: Is this something counsel can stipulate to so we don't have to go through all the mechanics?

MR. MC GARRY: We are willing.

MR. GUILD: I don't know exactly what you are going to ask. I asked Mr. McGarry a question and he said he wasn't the expert. So, it may require some supplemental information to stipulate.

I would be more than happy to take a break and see if we can work something out.

MR. MC GARRY: I think I can get through this in thirty seconds, Your Honor.

BY MR. MC GARRY: (Continuing)

Q In the FSAR, Final Safety Analysis Report, Volume I, I direct your attention to Table 2.3.4-1, and here it bears the caption "1975-1977 Wind Occurrences Ten Meters" and in the wind sector which I represent the wind is coming from the west southwest, so it would be going to your sector north northeast, does it not reflect that the percentage is five point two two?

A (Witness Twery) This is a twenty-two and a half degree sector.

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Q That is correct.

A That is correct. The figure reads five point two two.

Q And then directing your attention to the Sandia siting document that we have been discussing, and directing your attention to Page A-21, that's Table A.4-1, bearing the caption "Site Windrose Data Probability of Wind Blowing Towards Sector."

If you look under the sector east northeast, which is your sector --

A Uh-huh.

Q -- come down to Catawba, does it not have a figure, point zero eight seven?

A Yes. I took my figure out of the next column. Obviously I was off by one sector. The northeast southwest one reads point two zero seven. And that's one which I took by mistake.

Q So, you would correct your testimony accordingly, then?

A No. My testimony -- perhaps it did not say the context in which I was giving it. The context of my testimony, I do not intend to give exact figures because,

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as a statistician, I know that the figures I am using here and that are available contain large amounts of error. I would not expect that I am right to within half an order of magnitude.

What I was trying to illustrate was the reasons why I could not accept, as my own feeling of personal danger, the lower bound that was given in the report and trying to indicate the reasons why, namely that I live in a section of Charlotte towards which the wind generally blows from Catawba, that the Catawba plants between them have eighty years of reactor life, that the population density is much larger in this section than it is in the majority of the annular ring which was considered, and that my personal evaluation of preparation was somewhere perhaps in the neighborhood of a summary or even less preparation.

And on the basis of those, I said that my own subjective evaluation as taking the available data, the data that was available to me, was that somewhere between thirty-five to three hundred and fifty, not early fatalities but people being exposed to 200 rem. I should correct that. During the life of the Catawba

#11-4-SueT1

reactors using the best that I could get of the NUREG figures, and assuming a somewhat imperfect preparation plan, and from my point of view, I thought this was favorable towards saying that the cost of a good preparation plan, since it could make the difference between thirty-five and three hundred and fifty early fatalities, and that that brought heavy exposures, that that would be-- that order of magnitude, starting from such a large base would be something that is worth considering.

I do not purport to say that these figures are right. And instead of thirty-five to three fifty, I would agree with you that it should be perhaps as low as, be one third of that, ten to a hundred and ten. I don't think that the accuracy of the figures are great enough for me to hesitate at all in saying that there is that much uncertainty on my own part.

The figures you showed me were for 1975-1977 wind conditions Weather conditions this year have been a heck of a lot different. Some years I get my figure depending on when the -- if there were an accident, the 1975-1977 figures might be appropriate, since apparently neither you nor I know whether the data is -- puts me

#11-5-SueT

really less at risk than I should know myself to be or less at risk.

I have to just say I don't know. As little as I know about meteorology, I would say that there is quite a bit of change in wind direction variation from year to year, though, in long period swings.

Q You mentioned half an order of magnitude of a wind direction frequency.

A The data that you showed me and asked me to show where I got my figure from, I said I got it from the next sector nstead of the sector I'm in. I would say that -- I would guess that any of those percentages there could be changed by a factor of two, up or down, and that I would not be surprised if we could look at an eighty year -- forty year, rather, history.

Q Is a factor of two a half an order of magnitude?

A No. Half an order of magnitude would be half of ten, or five.

Q So the record is clear, then you are revising your statement with respect to the dose factor, half an order of magnitude could be two?

#11-6-SueT

A I'm saying that I'm waving my arms and all the figures we are dealing with are highly uncertain here. And I certainly would welcome any reason to worry less or more than I am here. I am trying to present a line of reasoning for the residents of southeast Charlotte and somebody who has had experience in trying to integrate information such as is made available here, I feel that the evacuation plan is something that I would like to see.

I'm just an informed person who has expertise in trying to do something with probabilities and numbers. I'm not saying they are exact. We don't know. As we have agreed, we don't know what the standard deviations are, how much variability there is from year to year, or how much of an error has been estimated in all the numbers we are talking about.

I might call your attention to the fact, along the same line of reasoning, that the figures that we are using are based on having twenty-three percent -- pardon, twenty-three percent basements whereas only sixteen percent of the private homes do have basements, according to the report in the southeast. So, the figures given on that basis are erred in the upper direction.

#11-7-SueT

JUDGE MARGULIES: Do you have much more on the examination of Mr. Twery? It would probably be an appropriate time to break here.

MR. MC GARRY: Fine. We can break now. Yes, Your Honor, based on the questions thus far and the length of the answers I think it would take more time.

JUDGE MARGULIES: We will recess until two o'clock.

MR. GUILD: Before you recess, may I have some clarification about the time allocations? I wasn't clear about whether the reversal meant Applicants and Staff are to divide the four hours and fifteen minutes.

JUDGE MARGULIES: That is correct.

MR. GUILD: And we have an hour and thirty -- yes, minutes for redirect?

JUDGE MARGULIES: That is correct.

MR. JOHNSON: Your Honor, I have a question on that last scheduling. To me, that doesn't represent what I understand to be the way in which the allocations were broken down. The entire time that was used up, it seems to me, by the Applicants four and a half hours,

#11-8-SueT

and the Staff is going to get a part of that. Even if that is correct, that wasn't my understanding.

The whole remaining times, not accounting for the Board's time, is then allocated to the Intervenor? That doesn't reprepsent what my understanding of the prior practice was.

JUDGE MARGULIES: That was my understanding of the prior practice, and what we did on 1 and 7.

MR. MC GARRY: I guess my logic is, Your Honor, when we have a shorter period of time we have to split it with Mr. Wilson, the Applicants and Staff. That hour and a half. That's the logic of why --

MR. GUILD: We have to split it between Palmetto and CESG, who are essentially identified in the same position on this issue as are Applicants and Staff with respect to the issues. And it seems imminently the way to do it.

But I thought there was some unclarity about it and that's why I asked.

MR. JOHNSON: My understanding was that there was a block given for the Intervenors and that was flip-flopped with the Applicants when it was the other way

#11-9-SueT

around, and that everything else, the hour and a half, or what have you, was everybody else, not just redirect.

JUDGE MARGULIES: Let's see if we can plan out the remainder of the time. What I have so far is that the Applicants have taken an hour and a half

MR. MC GARRY: I would suspect that we are going to be between an hour and a half and two hours.

JUDGE MARGULIES: In addition?

MR. MC GARRY: In addition. That would take three.

JUDGE MARGULIES: You pretty well balance out.

MR. JOHNSON: It seems to work out.

MR. RILEY: Mr. Chairman, Mr. Twery has to take a 6:35 plane. He has a rigid obligation tomorrow. I think it would be helpful in our planning to take note of that. He will have to leave here about 6 or a little before.

JUDGE MARGULIES: Do you expect you will be taking your full hour and a half?

MR. GUILD: I certainly hope not, Your Honor.

JUDGE MARGULIES: You will see how things

#11-10-Sue

develop?

MR. GUILD: I will have to see. The record should reflect that the witnesses are doing ably on their own and probably don't need any further questions from me. But I really do need to ask that we have the hour and a half.

JUDGE MARGULIES: We will let it go at that and recess for lunch.

MR. RILEY: Until?

JUDGE MARGULIES: Until 2 o'clock.

(Whereupon, the hearing is recessed at 12:58 p.m., to reconvene at 2 p.m., this same day.)

end #11

Jim flws

AFTERNOON SESSION

(2:00 p.m.)

JUDGE MARGULIES: Please come to order.

We will resume the hearing

Whereupon,

JESSE L. RILEY

STEVEN C. SHOLLY

and

RAY TWERY

resumed the stand as witnesses on behalf of Intervenors and, having been previously duly sworn, were further examined and further testified as follows:

CROSS-EXAMINATION

BY MR. MC GARRY:

Q Mr. Twery?

A (Witness Twery) Yes, sir.

Q On page 2 of your testimony you indicate the density of population in your sector is ten times greater than the average density for the entire 50 mile radius; is that correct?

A Yes, sir.

That was intended as a round number.

MR. MC GARRY: I will show a document to your counsel first.

(Pause)

BY MR. MC GARRY:

Q I would like to show you a document from the FSAR, Final Safety Analysis Report, and I am looking at Table 2.1.3-13, which bears the caption, "2000 Projected Population Distribution, Zero to 50 Miles." "2000" being the year 2,000.

There is also another table, Table 2.1.3-11, which is "1981 Projected Population Distribution, Zero to 50 Miles."

A (Witness Twery) What is the source of the information in this document.

Q This is the Final Safety Evaluation Report, I have shown you Volume I that we looked at earlier; this is one of the documents that Duke has submitted in this proceeding.

Now --

A I still don't know the source? Were these Duke's estimates about each of their areas?

Q That's correct.

Now, if we look at the total figure for the 50 mile circle, if you will --

A Yes.

Q -- it's 1,656,093; is that correct?

A That's what it says; yes.

Q And you're in the east-northeast sector --

A Um-huh.

Q -- so the total population for that sector is 218,184; is that correct?

A That's the number it says there.

How long are these sectors? This is a slice of pie that is labeled east northeast?

Q That is correct.

A And it is -- extends from the Catawba plant out towards Charlotte, how far?

Q 50 miles.

A 50 miles; okay.

Q Now, if one were to ascertain the population density, isn't it appropriate for one to divide that figure -- let's take the total population of 50 miles -- by pi r squared? -- to get the area of that circle, and divide that into the total population to give you the population density?

A Population density per square mile; yes.

Q And I calculate that to be approximately 210?

A Um-huh.

Q Would you accept that, subject to check?

A Yes, I assume your arithmetic is right.

Q And then if we look at the east northeast sector, would it be appropriate to divide that by pi r squared divided by 16?

A Since it's 1/16 of a circle; yes.

Q And I calculate that to be 444.

A Your calculation is quite correct, sir.

But it has no relevance to my statement.

Q Why is that?

A You're talking about a slice of pie that is 50 miles deep, and I believe you said I was 14 miles from Catawba?

Q That is correct.

A Now, I would say in looking at the map here that's on the wall (indicating) that 50 miles from Catawba will take you far through northeast Mecklenburg County and that part of the pie which has the largest part of the area of the slice is the part that's least densely -- least densely populated.

And so, I'll agree with you that the slice of pie that you named is only twice as dense as the area altogether; but, still, if you looked at the part that I lived in, which is within the EPZ, which is what, about 20 miles from Catawba to downtown Charlotte? -- that part of the slilce has -- would certainly have less than a third of the area in the whole slice of pie, and at the same time would have a much -- much of the population in the pie.

Based on the figures that you just showed me I would say that maybe my 10 is high, and maybe it only should be 8.

If we could look at census tract data, and could look at my census tract, and compare the area of my census tract with the population recorded in 1980, that would very strongly persuade me I was wrong if the figures came out to be very much more different than 8 to 10.

Q But you did not perform that --

A No, I did not, sir.

The 10, as I say, is a ballpark figure.

Q One of the points of ocnfusion I had in my mind --

A Yes, sir.

Q -- is you take a 50 mile circle, and you look at the population in that 50 mile circle; and you do go out 50 miles --

A I didn't, sir.

Who are you saying goes out 50 miles?

Your figures do here. The NRC study --

Q Your testimony, density of the population in this sector is 10 times greater than the average density for the entir 50 mile radius --

A Yes, sir.

Q All right.

So, you are --

A I was trying to relate to the publication.

Q Going out to a 50 mile radius? Okay.

A Okay, I was correct in that one number anyway.

Q And you use that on the one hand, 50 miles; and you get a population density; but then on the other hand, rather than taking a smaller 50 mile sector, you take an individualized sector; and to me it seems like there's a comparison of apples and oranges?

Tell me why I am incorrect?

A I don't think the 50 mile radius is certain from everything I've heard here today, and I am not an expert in what happens when you -- to nuclear contamination, how you get contaminated, how this happens, depending on meteorological or other nature of accident conditions, but the little bit I've heard seems to indicate that people are worried about shorter distances, say, 25 miles radiuses or something like that.

So I don't understand why the 50 was used -- the 50 was used by the NRC, and I assume with good reason. Although I don't know what those reasons are.

For the -- my own personal reason, my personal basis for selecting a -- considering a much smaller sector, a sector of a much smaller circle, is that the only thing we're talking about here today is the part of Charlotte that's between downtown Charlotte, basically, and the Catawba reactor.

That isn't 50 miles. And I'm only interested in, given the fact as I said once before, conditionally, given that

I live within this section of Charlotte, what's happening?

Q I understand that. And I understand why you focused on that sector.

But, you then compare it to a number that goes out 50 miles, and then back down to get a figure that you cite in your testimony?

A Yes, sir.

Q So at some point in time you are recognizing that here you can't go out 50 miles and get this data.

But let me ask you this question:

Are you familiar with the analysis and input that went into the Staff's derivation of this 50 mile radius figure?

A All I know is they report a 50 mile radius figure, and I didn't see any substantiation as to what the SOP -- standard operating procedure -- is for what size area to consider.

And I presume that it is to make the computer simulation amazingly more complicated and involved. If they had looked at the fact that population density varied throughout the disc, so they assumed a homogeneous disc.

Q That's what you say. You say, apparently they assume this uniform --

A Yes.

Am I correct that this is essentially what the --

Q Well, I want to ask you to turn your attention to the Final Environmental Report --

MR. GUILD: For the record -- I am not clear on this:

Is counsel indicating that the data in 0921 was the year 2000? Because that was the substance of your question.

MR. MC GARRY: No, it's page 537.

BY MR. MC GARRY:

Q Do you have the Final Environmental Impact Statement before you?

A (Witness Twery) I think there may be one available to me; yes.

Q Turn to page 5-37.

A Um-huh.

Q And there at the bottom of the page I read as follows: "Environmental parameters specific to the site of Catawba Station have been used include the following:" And the second bullet is: "Projected population to the year 2000 extending through a region of 80 kilometers -- 50 miles-- and 563 kilometers -- 350 mile radius from the site."

Is that correct?

A Yes, you are reading correctly.

I'm with you there.

Q Mr. Sholly, let me ask you a question based on

your experience:

Is it common practice in the NRC to spread population out uniformly in an FES analysis?

A (Witness Sholly) Well, I've reviewed CRAC outputs perhaps a dozen analyses, and what they do -- I think it's 1970 census data which they have available; and what they do, they assign it to sectors and divide the entire area considering all existing compass directions.

And then the CRAC code allows 34 distance increments out from the plant, and you assign population to the wedges and distance interval from the plant.

And it's based on census tract data that was available for 1970.

Q So those set points as you go out could have different population densities?

A Yuh, now, each of those pie slice and distance slice, then, the population density within that is considered to be uniform; but each one of those little pieces is different from another.

A (Witness Twery) Is that --

Q There is no question pending.

Mr. Twery, now directing your attention to the bottom of page 2, you talk about the uncertainty factor of 1 to 100, 10 to 100 --

A Yes.

Q Do you see that at the bottom of the page of your testimony?

A Yes, sir.

Q Would a professional statistician always pick values that would give you the worst-case consequences?

Wouldn't a statistician use the mean or some representation of a distribution for decision-making purposes?

A It would certainly vary by the statistician, what school the statistician was for, what kind of decision-maker the information was being presented to, the nature of the decision, and all.

In commercial decision-tree uncertainty analysis that I have done the typical thing has been to present some idea of what the probability distribution is, including stating what the mode is of the probability distribution; and to usually state with the tenth to the ninetieth percentile were to give the full idea of the -- where the bulk of the probability would seem to indicate that you were.

Q And the uncertainty could go up or down, correct?

A The purpose of giving the tenth and the ninetieth percentile idea would be to show that there was a range and just how narrow it might be, where reality might be

or where we might end up.

Q Would you multiply .35 times -- 10.35 times 100?

A Yes, sir.

That was the numbers that were recorded by -- in the -- I don't know what page it's on -- in FES in the draft; there was the -- the technical statement was made that these probabilities are not wrong much; they might be wrong by a factor of 10. They are unlikely to be wrong by more than a factor of 100.

Q Couldn't then the value be .01 that youmultiply the .35 by?

A I don't have the statement in front of me and it would take me a while. I dont want to use up all your time trying to find it in the Draft Environmental Statement.

My interpretation was that if the probabilities -- the basic approach that was being made in the particular paragraph in which the factors of 10 to 100 was offered, were given with the idea that for various reasons it's conceivable that the numbers given were actually toward the lower end of what the probabilities of an accident might be or damage might be; but that's -- 10 to 100 was certainly the worst that it could get beyond that.

Somebody just found that reference for me?

This is the Final Environmental Statement, and it's

pages 5-47, and it's the last sentence in the next to the last paragraph.

Yes.

Q Page 5-47 of the Final Environmental Statement?

A Yes, yes.

Q And that gives the qualitative judgment of the Staff that the uncertainty bounds could be well over a factor of 10, but not as large as a factor of 100?

A Yes. That is the phrase I was --

Q And that uncertainty can go both ways? Isn't that correct?

A At this time you could interpret that it might go both ways.

And I would agree that maybe the uncertainty could go in either direction. I don't know what the intent of the Staff was. Certainly reading the one statement by itself at this time indicates that the Staff may have meant they could -- that their probabilities could be too high as well as too low.

That was not the way I interpreted the sentence at that time, at the time I extracted the information.

Q Turn to page 3 of your testimony.

A Yes, sir.

Q About 10 lines down you say, "we are talking about an expected economic cost of $35 million to $350 million just

from early fatalities."

A It should have been -- a correction, too --just from people with over 200 rem exposure.

Q But let's just explain, let's talk about that for a second.

The premise is $1 million per life?

A Yes, sir.

Q Now, are you going to change your testimony and say it's $1 million per injury?

A No, sir.

I would accept the fact that Mr. Riley corrected me; 200 rems I unfortunately extended to say that the person would be killed for sure instead of just sick.

Q So then that correction would modify this statement?

A It certainly would. I don't know if anybody can provide a statement -- that somebody can provide to me some idea of what happens when somebody gets 200 rem immediate exposure, I'll be glad to use that information to change my statement here.

Q Well, absent that knowledge, then, you don't have a basis for making any cost reductions; isn't that right?

A The cost projection, absent that knowledge, I would say that it would be somewhat less than that ballpark that I showed here; yes, sir.

I don't know how many million dollars it would be.

I'm just used to thinking of things in dollar values. I had felt that this economic basis was used for the Catawba reactors and should be put into service, that the same basis might be appropriate as part of considering whether the cost of extending the evacuation area to southwestern Charlotte might also there be an economic consideration.

Q Well, Mr. Twery, let's just look at these numbers --

A Yes, sir.

Q You state there the expected economic loss, and what you've done is you, on page 2 you walk through starting with a base number and put on there as a factor so you finally get a factor that it is 35 to 350; and then you apply $1 million to that; and you get $35 million to $350 million; correct?

A Yes, sir.

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Q Yes, I think we have just gone through and determined that with respect to the uncertainty, you factored in the high side of uncertainty. You didn't factor in the low side of uncertainty.

So, I ask you rather than being the expected economic cost, wouldn't this be the maximum, if indeed we are talking about fatalities?

A I am not sure, sir, because I haven't looked at the uncertainties on the other side. I do not know what, -- if you are going to say economic costs, then I don't know what the economic cost is of people who have gotten between 25 and 200 rem exposure. I don't know what the economic cost is of the loss of my house permanently that nobody is going to reimburse me for it.

I don't know what the increase above the two original point 0022 figure should have been, because of using an actual expected value instead of a lower bound for the expected value of loss, which was the place that I started from.

Q Right.

A I don't know whether that .0022 should be .0024 or point 0032, or just exactly what it should be, because we have fewer basements in the southeast than they do in the northeast. We may even have fewer brick houses in the southeast than they have in the northeast. There are lots

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of factors in both directions. The only thing I am trying to say is in my personal evaluation -- one could say that a reasonable set of assumptions could lead to a much larger value than the middle area, and I am not saying that the middle area in FES is wrong.

I am saying that there is a logic that one could go through to say that a person living in the southeast area of Charlotte might actually have a little bit more interest in an evacuation plan than a surface acceptance of the figures given in FES might indicate.

And I wouldn't say that even within a factor of a hundred that any of the numbers that I have given here are really correct. I am not absolutely positive of that, because I am not even sure if I used the exact figures right from your original study that you showed me, or the meteorological data that was actually used in the DES, how much different things would look.

I am just trying to say that because of the way that things were done, the best that I could determine from the sources of data that were generally available, it seems reasonable to assume that one possibility is that there could be extensive economic costs. The expected value of economic costs from radiation damage over a period, the life of the reactors, might actually be a considerable amount rather than an amount of less than a million dollars.

If you would agree with me that a figure between five million and fifteen million was a reasonable number --

Q Your Honor, I am going to have to stop him.

A I am sorry.

Q I do have time constraints.

A Excuse me.

JUDGE MARGULIES: I look upon counsel, if they feel they have time constraints, to raise the objections.

MR. McGARRY: That is what I am doing at this point.

WITNESS TWERY: Excuse me.

BY MR. McGARRY: (Continuing)

Q Mr. Twery, at the bottom of page 3, you talk about resettlement costs of a hundred and twenty-five dollars per person. You say it seems low by the factor of 10 to the 3 and 10 to the 5, isn't that correct?

A Yes, sir.

Q Now, what do you entail -- what do you mean by the term, 'resettlement?'

A I am saying that is resettlement consists of more than bread, water and bed for one week, and includes the fact that I have -- I no longer have a home that I can use, or two cars that I can use, dead dog, dead trees, dead everything, whatever else that I can't use, and I have to resettle in total, that the total amount of that resettlement

cost, defining it that way, would certainly be much more than a hundred and twenty-five dollars.

Q What would it be when you apply these factors of 10 to the 3 and 10 to the 5?

A Ten to the 3, I would say 125,000.

Q And 10 to the 5?

A You would add two zeroes, two zeroes to that, and take it over a million dollars.

Q What would it be. If you add two zeroes, that would be --

A That would be twelve-five, sir.

Q Twelve million, five hundred thousand dollars per person?

A That is correct. I am saying it would be somewhere between a hundred and twenty-five thousand, and twelve million -- am I off one? If I put three zeroes after it, it makes it a hundred and twenty-five thousand. If I put five zeroes after it, it is twelve million, five hundred thousand. It certainly is a very large ballpark, but I think you will agree that my hundred and twenty-five thousand is rather modest.

My house and cars and furniture costs that much, or more than that replacement value.

Q Now, you have the yellow book in front of you, the FES?

A I can get that, yes, sir.

Q And turn to page F-3.

A Appendix F-3?

Q That is correct.

A Yes, sir.

Q And just above Section F .2. The sentence just above, for either of these situations, the cost of evacuation and relocation is assumed to be a hundred and twenty-five dollars (1980 dollars), per person, which includes cost of food and temporary sheltering for a period of one week.

A Yes, sir, that is where I agreed with you on my previous statement. I said if you could include in settlement cost total resettlement instead of just providing bread, water, and bed for one week, I think that a hundred and twenty-five dollars per person is quite low.

And that is another economic cost, redefining the term from the way it is used in that sentence.

Q That finishes Mr. Twery. We do have a Motion to strike based on that last answer, that the relocation costs are an item that was ruled out by the Safety Board. We also move to strike item (c) on page 4. The adequacy of medical facilities, was ruled out by the Board on September 29, 1983 Order, at Page 5, and the relocation matter

was ruled out by the Board in March 5, 1982 Order, at Page 34.

MR. GUILD: Mr. Chairman, if I could, belaboring the first point, the matter is belated. Mr. McGarry's motion to strike wasn't founded a bit on his examination of the witness. It speaks to the expressed terms of the prefiled testimony which we have had in front of us now for I don't know how many hours. Beyond that point, the Board may rule in or out of Contention, or rule in or out facts; the facts that are contained here are facts the witness focuses on with respect to his view that there has been an understatement of economic costs associated with various aspects of emergency planning in the purview of his testimony.

It is not simply complete to say that the licensing board ruled out a contention on medical facilities without answering the issue of whether or not Mr. Twery can talk about the point. The Board has already ruled on that issue with respect to Mr. Riley's testimony. We believe that since the adequacy of the medical care is determinative of the consequences of the model in the FES, it is obviously relevant to his testimony, which focuses on the FES consequences

Secondly, as to the resettlement costs, Mr. McGarry is simply off base in suggesting that the ruling on a contention that had to do not with the issue of

resettlement cost, but with the issue of feasibility of relocation as an emergency response measure should govern the issue of whether or not Mr. Twery can comment on the obvious inadequacy of the hundred and twenty-five dollar figure as an economic cost of one clear aspect of the emergency plan.

Both points are properly included in Mr. Twery's testimony.

JUDGE MARGULIES: The Board will deny the motions. In regard to the resettlement costs, the matter is fully explained on the record, and it is in the record, and it would serve no purpose to strike the testimony.

As to (c), we ruled on a similar objection twice previously, and the same ruling. The motions to strike are denied.

BY MR. McGARRY: (Continuing)

Q Mr. Sholly, what do you believe are the major plant features that are important to characterize a release in the event of a core melt?

A (Witness Sholly) Generally, or for ice condenser plant?

Q I will say -- why don't you start generally, and then give me --

A The probability of a release or the size of the release. I don't recall.

Q What are the important characteristics that one would focus on in determining in a core melt event, the amount of release that could be generated?

A The number of things being the operating history of the core up until the point of the accident, it would be a matter of what type of accident sequence you are in.

Whether it is a pipe break, or whether it is transient, that would affect the possible deposition of radioactive materials in the primary system. It would then depend on the status and functioning of engineer safeguards, ice condenser. It would depend upon the status of container heat removal, and determining at what point the containment might fail.

It would also depend on the interaction of the core material after the vessel is breached, whatever it winds up on, whether it is the containment floor, whether it is a pool of water. Exactly where the molten core material winds up after the vessel is breached.

Q The containment integrity would be important?

A Absolutely. All else aside, that is probably the single most important factor, all other things being equal.

Q Turning to page 19 of your testimony, you make reference to NUREG 1131.

A Yes.

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Q What reactor site does 1131 consider?

A It doesn't consider specific site. It presumes a population density of a hundred persons per square mile. It uses meteorology from a particular site. I am not aware of anywhere within the document itself that it indicates which site was modeled.

If you consider the information that is in the Sandia Citing Study, for instance, it wouldn't make a huge amount of difference which site is used for this purpose. There are some exceptions to that;if you use a site that has an extremely frequent rainfall as opposed to a desert site, or something like that.

You can get more extreme values. I presume that the authors were intelligent enough not to do that.

Q Now, with respect to your testimony in that part which relies on this NUREG/CR-1131, does that document use the reactor safety study release categories and category frequencies?

A Yes. At some point in the analysis, segregates further the core melt release categories, which covers PWR-1 through 7, and segregates them into basemat melt events, in an atmosphere of containment failure event.

But in the particular dose versus distance consequences, are weighted by the relevant probabilities of each of the PWR-1 through 7.

Q As I understand it, Mr. Sholly, there are two weightings that are associated with those PWR categories. PWR release categories 1 through 5 are given one set or ratings, and PWR categories 6 and 7 are given another set of ratings, is that correct?

A I am not sure that is correct. If you can point me to something in the document that you may be relying on in asking your question, I will be happy to try to clarify it, but I don't think that is correct.

I am fairly confident it is not, because I have seen other calculations that individually use each PWR, calculate them separately, and those results are rather different.

Say comparing PWR-2 with PWR-5.

Q How are the dose calculations that are set forth in NUREG CR-1131 related to NUREG 0396?

A In many cases they are identical. 0396, in fact, reproduces many of the figures identically. There are additional things in NUREG 0396 beyond what was in 1131, and those relate to those calculations of design basis accidents.

Q You have some curves attached to your testimony, which I take it come from 1131, is that correct?

A Well --

Q I think that is Figure 5.2? Figure 5.3?

A The ones I copied were from 0396, but I am sure they are reproduced somewhere in 1131.

Q You have several curves here. Figure 1-11, the first one. Isn't that 0396?

A Yes, it is.

Q That is 1-38 of 0396, I believe.

A 1-38, yeah, yeah, 0396.

Q Now, turning to the next page of your testimony, you have a set of curves figure, 5-2, 5-3, 5-9, 5-10 --

A Those are from 1131.

Q That was my question. How do those curves relate to 0396?

A They break out values into the melt through release categories in the atmosphere release categories, and show for both mean and 95 percent level, that level which is exceeded only five percent of the time, according to a couple of different sets of assumptions on emergency response or sheltering.

Q Now, doesn't 1131 perform two analyses? One for PWR categories 1 through 5, and another analyses for PWR categories 6 and 7?

A Yes. And if you look at the figures that are on the testimony, 5-2 and 5-3 are for PWR 6 and 7, the melt through release categories, and Figures 5-9 and 5-10 are the mean 95 percent results for the atmospheric release

13-12-Wal

categories.

Q Now, looking at curves -- let's say 5-9, as I understand it, these curves are based upon PWR release categories, and the release probabilities of the reactor safety study?

A That is my understanding, yes.

Q And these curves are for PWR-1 through 5 release categories, is that correct?

A That is right. Those release categories involving a core melt, and the failure of the containment to the atmosphere.

Q It is my understanding that you used these curves as a representation of all the release -- of all the Sequoyah RSSMAP release categories, is that correct?

A For at least the atmospheric releases I think that is correct.

Q What releases did you not use them for?

A Well, I wouldn't have used PWR-1 through 5 in a melt through scenario. Those would have been referred to Figures 5-2 and 5-3.

But for the atmospheric releases I used 5.9 and 5.10.

Q And what fraction of the release scenarios are the core melt in RSSMAP?

A Well, the RSSMAP study referring to Chapter 9,

only concerned itself with the atmospheric release category, so it assigned the dominant accident sequences to release categories 1 through 5 because, for instance, the reactor safety study showed that those were the ones that tended to dominate risk, and that the melt through categories were of less importance.

End 13.

#14-1-SueT

I should also note, referring to the section in the testimony where it discusses the differences between the PRA results for Surry and Sequoyah, this appears on Page 11 of testimony. Look at the second bullet on that page --

MR. JOHNSON: Could you give me that page again?

WITNESS SHOLLY: Page 11. If you look at the second bullet on that page, overpressure failure of -- that essentially makes the point that -- not the second, I'm sorry. It's on Page 12, the very last one, makes the point that containment base melt through sequences for Sequoyah are, at least by this study, always preceded by an overpressure failure to the atmosphere.

BY MR. MC GARRY: (Continuing)

Q So, with respect to release category 6 and 7, and directing your attention to RSSMAP, for all intents and purposes, they don't consider those occurring; is that correct?

A No, because you have an atmospheric failure before the containment base melts through. The only

#14-2-SueT

way that would be important is if you are doing a full blown risk assessment and want to consider the pathway of releases.

Q Now, looking at Figure 5.9, doesn't PWR release category 2 dominate among the Reactor Safety Study release categories 1 through 5?

A Well, I don't think you can tell that from Figure 5.9 but in general PWR 2 dominated the consequence results. So, that's correct.

Q And with respect to RSSMAP, doesn't RSSMAP focus on Categories 3 through 5 as being the dominant?

A (Witness looking through documents.)

If -- do you have a copy of the RSSMAP study with you? You could look at this one.

If you go through Page 9-13, what this does is show a comparison using a bar graph or block diagram. The Surry results are depicted as the white blocks and the Sequoyah results are depicted as the ones with the small box in them.

MR. JOHNSON: Could you list the page again, please?

WITNESS SHOLLY: It's Page 9-13.

#14-3-Sue

BY MR. MC GARRY: (Continuing)

Q And would you concur, looking at that figure, that Categories 3, 4 and 5 dominate for RSSMAP?

A Perhaps 3 and 4 do. 5 doesn't figure in much because of the results for 2, 3 and 4.

Q And that's a logarithmic scale, is it not?

A Yes, I believe so.

Q Now, aren't release categories 3, 4 and 5 less severe than the Category 2?

A Yes.

Q Yet your curves reflect dominance of release category 2, so they don't represent RSSMAP; isn't that correct?

A To that extent, that would be correct. However, if you look at the release fractions for the Reactor Safety Study release categories, taking a look at PRW 4 and 5, they generally involve -- well, less than ten percent release of iodine, cesium groups, and everything else. It's smaller than that.

Those releases would have to occur quite a bit more frequently than PWR-2 for them to actually dominate risk. I would agree with you that it's quite

#14-4-SueT1

clear that they occur more frequently but their margin of difference is perhaps a factor of, what, two or three, perhaps, judging from Page 9-13. And without actually running consequence calculations similar to what they did in 0396 and using the Sequoyah values, I still say PWR 2 would still be dominate because the release fractions are so much larger.

Now, just for example if you were to have a plant where the difference in probability was, say, a factor of fifty or a hundred, between PWR 3 and 4 and PWR 2, then it might be a different situation. But this is only a factor of two or three.

Q Looking at Figure 1-9, 9-1 of the Sequoyah, isn't the percentage of releases of PWR categories 1 through 5 much lower for RSSMAP than they are for the Reactor Safety Study?

A Would you repeat your question again? I'm not sure I got it.

Q Now, directing your attention to Figure 9-1, isn't the percentage of releases of PWR Categories 1 through 5 much lower for the RSSMAP than they are for WASH 1400?

#14-5-Sue

A I don't understand the question, and I will tell you why, because both studies have releases in Categories 1 through 5. Release categories 1 and 2 have almost the same frequency as analyzed. 3 and 4 are more probable. And 5 is somewhat more probable.

I'm not sure I understand the gist of your question. If you were to sum the frequency for all of those release categories, Sequoyah would come out with the greater frequency of releases. And I doubt that's the point you were trying to make.

Q But your curves are conditional upon a release of Categories 1 through 5. It's not an absolute; is that correct?

A That's right. That's right. Ideally, had I access to the CRAC code setup, I could have input the relative frequencies of release categories 1 through 5 representing Sequoyah into the code, and done the calculations. I did not have that opportunity.

Q Isn't it correct, though, it's a publicly available code?

A It is publicly available. It requires an extremely large computer to run it. A CEC 7600 is

#14-6-SueT

typical, and I simply don't have access to one. I could have great fun if I did.

MR. CARR: I'm sure you could.

(Laughter.)

WITNESS SHOLLY: That would have been the ideal thing to do, though, as I say.,

BY MR. MC GARRY: (Continuing)

Q Now, directing your attention to Page 7 of your testimony.

A Page what?

Q Page 7, Answer 9. And on this page you appear to have -- you focus on one mile.

A Yes.

Q Release category, whole body doses and thyroid doses at one mile and you assume no protective action for forty-eight hours.

A That's right.

Q Are you familiar with Contention 11?

A Yes.

Q And what is your understanding of Contention 11?

A It focuses on the expansion of the EPZ from

#14-7-Sue

ten to seventeen miles. This was simply to indicate the variation in dose among the different release categories if no protective actions were taken. Granted, the results would be different at ten miles or seventeen miles, whatever distance you care to choose. These results were available, and I presented them simply for illustrative purposes.

Q But not as representative of the situation at Mile 10?

A No, absolutely not. It very clearly refers to one mile. And it stands for two principles really. It shows you are going to need to do something at that distance and that you take the most optimistic assumptions you want to make about sheltering at that distance, and it doesn't buy you a lot of time for the long run.

So evacuation would be absolutely necessary.

Q Now, with respect to Page 9 and 10 of your testimony, Answer 13, and you appear to acknowledge that for normal operations one can compare favorably the Surry unit and the Catawba unit, but then you continue on Page 10 and say that for accidents it is not proper to assume a comparison; is that correct?

#14-8-SueT

A Yeah, meaning in terms of risk or situations in which you would be concerned about emergency response, normal operations are essentially irrelevant.

Q Do you have the Final Environmental Statement before you?

A Yes.

Q Appendix E. Would you turn your attention to E, Page 1?

MR. GUILD: What page again, counsel?

MR. MC GARRY: E-1. I would just like to read several things to you and see if these statements have a bearing on your testimony.

BY MR. MC GARRY: (Continuing)

Q Paragraph 1. The results of the Reactor Safety Study (RSS) have been updated. The update was done largely to incorporate results of research and development conducted after the October 1975 publication of the RSS and to provide a base line against which the risk associated with various LWRs could be consistently compared. Primarily the base line RSS results (NUREG/CR-1659) reflect use of advance modeling of the processes involved in melt down accidents.

#14-9-SueT

And it continues. I will now move to the third paragraph.

The Reactor Safety Study Methodology Application Program (RSSMAP) has resulted in a review of dominant accident sequences for several plants. The Sequoyah RSSMAP risk assessment indicates the importance of hydrogen control measures for reducing the likelihood of failing ice condenser containment following severe accidents; Catawba has an ice condenser containment like Sequoyah. The Applicant for Catawba has plans to satisfy the Commission's requirement on hydrogen control; therefore, the use of the Surry base line sequences is appropriate since a Catawba plant specific assessment of accident sequence is not available.

Do you agree with that statement?

A No, I don't.

Q What is the basis?

A There are several things which factor into this. I was aware at the time that I did this analysis that the RSSMAP did not account for the hydrogen control measures. I had a limited amount of time to do the analysis. I did not have available to me the liability

#14-10-Sue

data on the hydrogen control system. It would also require some very detailed study going from scratch, probably taking several months. If the work has already been done, I would have needed access to it. You would need to establish the reliability characteristics of the igniters if there are any mechanisms by which they failed, if there were environmental conditions which could cause them to fail such as plugging by aerosol, whatever. You essentially need to consider not only the improvement in risk that you would get by installing the igniter but also the downside risk.

For instance, you could be in a situation involving a loss of power in which the igniters aren't working and nothing else is working essentially. The core melt release occurs in the containment, power comes back on. The sprays come on, the igniters come on, and you have a rather large burn. There is a whole litany of considerations that would be required to change the Sequoyah results to reflect the presence of the igniters.

I was not able to do that in the time I had available to me to prepare the testimony. Clearly, it would have an effect. How much uncertainty is introduced

#14-11-Sue

into that is hard to say. It could be a factor of ten; it could be more.

Now, on the other hand -- and this is also very important -- the Sequoyah RSSMAP study did not consider external events, nor do we have any idea of what external events could be a risk at Catawba. By external events, I'm speaking of events which are external to the system. And these include events like fires, earthquakes, tornados, hurricanes, in-plant floods. There is a list of a hundred or so possible external events in the PRA procedures guide.

If we assume that external events have no impact at all at Catawba, which may be a good assumption and it may be totally erroneous -- I have no idea -- if we are willing to make that assumption, then the results of my analysis would be very definitely effected by the presence of the hydrogen igniters. No bones about that.

On the other hand, we have no idea what external events would do to the risk profile of either Sequoyah or Catawba.

Q Now, the 0396 analysis was drawn from the Reactor Safety Study; isn't that correct?

A That's right.

#14-12-SueT

Q Does the Reactor Safety Study consider external events?

A Yes and no. Yes, it did address fires, earthquakes, tornados, and it concluded they did not contribute significantly to risk, less than ten percent of overall risk, and attempted to make that argument for all plants.

A subsequent analyses of Indian Point, Seabrook, and perhaps some others, have shown that that conclusion does not hold water on the site specific basis, that there are sites and there are combinations of reactor designs and the influence of external events that are very site specific, that can indeed have a tremendous influence on risk.

And so I think that part of WASH 1400 is well recognized to be invalid and hasn't been relied on, to the best of my knowledge, for quite some time.

Q Did RSSMAP analyze external events?

A No, it did not. It was a very limited study attempting to bank on the work that had been done in RSS and extend that sort of analysis to include a couple of different types of containment designs.

#14-13-Sue

If I may, for a minute, I can give you a reason why external events are very important for Catawba or Sequoyah.

Q If you don't mind, maybe your counsel could follow up on that. I appreciate it.

A Fine.

Q As I understand what you have just told us, Mr. Sholly, you have not performed any independent evaluation of the applicability of the Sequoyah RSSMAP or release category frequencies that would apply to Catawba?

A If you are asking me if I've done a Catawba specific PRA, absolutely not.

Q And the methodology you employed was to look at the RSSMAP and utilize the RSSMAP to draw your conclusions; is that correct?

A Absolutely, the sole point to that being it should be more representative of the performance under severe accident conditions than those in the Surry analysis.

Q And that you've also indicated the presence of the distributive ignition system could have impact on your results?

#14-14-SueT

A Yes, it could. And that would be in pretty much direct proportion to the reliability -- it would be pretty much in direct proportion to the reliability of that distributive ignition system.

Q And if the reliability were good, then a lot of the release categories set forth in the RSSMAP would shift over to Category 7; isn't that correct?

A I don't know.

Q Maybe 6?

A I don't know if that's true or not. But if whether at some later point you have no failure or not, that's one of the things we need to look at.

But what it would do would certainly be to shift the probability of the release categories 2 and 3 which are dominated by this hydrogen burn sequence downward. If, let's say, the reliability of the distributive ignition system is such that it only fails one chance out of a thousand, that would knock those down by about that much.

Q And you would more approximate Surry? Again, I'm asking you to assume that the igniters function and are reliable. If they function, you are going to get

#14-15-Sue

closer to Surry; isn't that correct, from RSSMAP?

A I don't think it's possible to say, because I don't know what happens if you burn that hydrogen with a distributive ignition system what happens after that.

See, the Sequoyah analysis stopped once the hydrogen burn fails the containment; that's essentially the end of the calculation.

You would need to carry your calculations with whatever containment models you were going to use, past the point at which that distributive ignition burn would take place, to know what would happen.

end #14

Jim flws

Q Do you have a grid map in front of you?

A Yes.

Q Table 85, which is page 8-17.

A Yes.

Q That table is captioned "Ice Condenser PWR Key Accident Sequence Containment Failure, Mode, Probabilities, and Release Category." The left-hand column bears the caption "Sequence" and there they have some sequences that are of interest, the S1D, the S1H, the S2D, the S2H; is that correct?

A Yes.

Q And then if we go over and look at, let's say Release Category-3, don't those gammas indicate a hydrogen overpressure?

A Hydrogen burn, the deltas indicate an overpressure.

Q Hydrogen burn?

Now, if we eliminate those hydrogen burns through the proper functioning of the mitigation system, then those release categories will no longer remain, those sequences no longer remain release category-3; isn't that correct?

A What I see is that you have a split between the hydrogen burn categories, they clearly shift to the right somewhere; perhaps the containment wouldn't fail; perhaps it would fail at a later time leading to one of the lower release categories.

But you also have those delta failures in there.

Q Now, does that release category-7 indicate that that's where they're probably going to shift to?

A I don't think it indicates here -- I suppose it's possible; but I can't tell from this.

If the containment doesn't fail, clearly it goes to 7.

Q What does the containment barrier pressure assumed?

A I believe it was 45 pounds plus or minus a few pounds. I don't remember exactly; but that's the number that comes to mind.

Q If you turn to page 8-4 of the RSSMAP?

A Oh, I'm sorry, excuse me.

Yuh, psia, it's 30 psia, plus or minus 3 psia.

Q And are you aware of the fact that the Catawba -- that the SER reflects a containment pressure of 72 psig?

A I was not aware of that.

Q Thank you.

We mentioned it yesterday. Do you have the Safety Evaluation Report?

A No, I don't. I've not seen that.

Q Counsel has; we talked about it yesterday. It's page 3-24, it's paragraph 22 on the left-hand side.

A Um-huh.

A (Witness Riley) I think it should be added at this

point that yesterday it was also the testimony that at McGuire the Engineering Department of the State of Iowa made a calculation under NRC contract, and found the average failure pressure for the McGuire containment would be 80 psig, with a standard deviation of plus of minus 20 psig.

And I feel that the inclusion of the standard deviation would contribute much to the interpretation of this 72 psi that's just gone in the record.

A (Witness Sholly) Have you question about proposing about 72,000?

A (Witness Riley) Okay.

Q Do you know what effect a higher containment pressure would have?

A (Witness Sholly) For any accident sequence which does not bypass the containment; and the only one that does in that study is Event-Z. You might also have steam generator tube ruptures which would bypass the containment, but those weren't included.

For the sequences which don't include containment bypass, it could delay containment failure for some of those sequences to a later time, at which fission products move and systems would have a chance to operate; natural deposition certainly would have a chance to; and it's possible that the releases could be lower.

Without the details of the MARCH analyses

for such sequences it may be possible that some of the sequences wouldn't change all that much; it would depend on how fast the pressure was rising and what's driving that pressure rise.

In other words, whether it's water sources or whatever it is, and some factor that would terminate pressure before it would reach 70 pounds.

There's no nice, easy, simple, answer for it.

MR. MC GARRY: May I have the Board's indulgence? I have one more question.

(Pause)

MR. MC GARRY: Thank you, your Honor.

Thank you; that concludes our cross-examination.

JUDGE MARGULIES: Staff has cross-examination?

MR. JOHNSON: Thank you.

CROSS-EXAMINATION

BY MR. JOHNSON:

Q Mr. Sholly, I'm George Johnson.

A (Witness Sholly) Hi. While we're hot, you'll start with me; okay.

Q I'm George Johnson of the NRC Staff.

In your testimony on page 17 in answer to Question 19, you state, "NUREG-9396 serves as the explicit technical basis for the size of the plume EPZ, and therefore represents a logical starting place."

Now, as I read from the document, NUREG-0654, Revision-1, the planning basis -- it's on page 12 -- the size, about 10 miles radius, of the plume exposure, EPZ, is based primarily on the following considerations:

A) Projected doses -- do you have it before you?

A Yes.

Q So, it's A, B, C, and D. It's written in several places in your testimony. And these planning bases for these -- bases for the 10 mile EPZ are derived from NUREG 0396.

A Perhaps with the exception of B.

And D say that detailed planning within 10 miles will provide a substantial base for expansion of response efforts in the event it is proved necessary.

I don't recall seeing anything in 0396 about [illegible]. However, it was in the Commission's Statement of Considerations on the Emergency Planning Rule. And I got that.

If it is in 0396, I'd like to be aware of it.

Q There is a statement that I'll show you; it's on page 16.

Q In the main report?

Q Yes.

A Okay.

Q It's the first full sentence on page 16, four lines down.

A Thank you.

Q Now, as I understand your testimony, one of your problems, the major difficulty with NUREG 0396 that's a planning basis for determining the 10 mile zone, is that it's not a Catawba-based -- it's not based on a PRA for Catawba; it's based on other analyses.

Is that correct?

A Yuh. It would ideally be the case it would be based on a plant-specific analysis.

Q If you were to put that difficulty of yours aside, would you agree that those four bases constitute a proper foundation for determining the size of the EPZ?

A No. And let me explain why:

Two principle points: first of all, item D on page 12 of NUREG 0654, if you consider for a moment what the implications are for an area the size of Charlotte, a town the size of Charlotte, on the immediate boundary of EPZ, in terms of emergency response, the things that would be done, I would venture to say that you would find that -- a greater concentration of special facilities: hospitals, schools -- to go on and on. You name it. -- in a much smaller area.

And you have an entirely different qualitative situation:

The population is much denser. The river network

is a little more restricted. Qualitatively it's a different situation.

I would agree that in most cases where you do not have the precedence of a fairly sizeable metropolitan area just outside an EPZ that D is probably true.

Where you have a densely populated metropolitan area on the immediate perimeter of the 10 mile EPZ, I don't think that holds an ounce of water.

And that is one of the key reasons why I recommend that some degree of planning be done for Charlotte.

And I think the testimony makes pretty clear later on, and not necessarily recommending that all of the things one would do within ten miles would be necessary for this extension. You would not need sirens. It could probably be demonstrated that one could go out with fire equipment and stationary sirens and notify -- an EBS message -- and notify a sizeable fraction of the population, without referring to more extreme measures, like, putting sirensup on top of skyscrapers and such.

But the basic point, the basic thrust of this is that ad hoc actions have a higher chance of failure in an emergency, populated, area than they do when you're in a less densely populated situation where basically you may have a few hundred people per square mile.

And my second problem with these four point is,

that there seems to be an excessive focus on early fatalities as a consideration in emergency planning.

Certainly the avoidance of early fatalities is important. But you cannot stop there.

And NUREG 0657 is the overall goal of emergency planning is to minimize population dose. But then it doesn't really seem to me it follows through on that in determining the EPZ.

In other words, a significant chunk of your population dose from release categories occurs outside 10 miles.

Certainly it can be knocked down by sheltering and relocation, but again, if you are not an extremely densely populated area, ad hoc actions will probably get you by.

If you're a densely populated area I think the chances of getting by on an ad hoc response are much less.

And in my view that argues for some real planning, assessing what your capabilities are, how fast you can implement them, some degree of public awareness that, you know, you may be called upon to do this so it doesn't take them by complete surprise.

And I think those minimal steps greatly improve your chances of success in implementing an emergency reponse in that area immediately outside the EPZ where you have a

dense population.

Q Are you aware that the testimony of Mr. Broome in this proceeding with regard to the status of emergency planning for Charlotte-Mecklenburg County, and the fact that the emergency planning staff and command is already a part of the emergency planning for Catawba?

A I didn't get the testimony until very recently. I didn't have time to look into it in great detail. I do remember some testimony to that effect.

And that would indicate that, at least, some of the initial work that would need to be done to include Charlotte has perhaps already been done.

Q Are you also aware that there's an All-Hazards Plan?

A That's not at all atypical for a large city.

Q For Charlotte-Mecklenburg?

A I am aware that it exists, yes.

Some of the problems you run up against with all-hazards plans is that they tend to be focused on small areas; for instance, a transportation accident where there's a hazardous materials spill; flooding -- flooding occurs within a pretty well-defined area; your railroad tracks only go through certain parts of the city, that type of thing.

And whereas with the distances that we're talking about with Charlotte and Catawba, you could involve

a fairly substantial chunk of the city in pretty short order in a big accident.

And you want to be sure that the all-hazards plan has the capability to be expanded to cover the entire city.

Q Do you still have page 12 in front of you?

A 0654?

Q Yes?

A Yes.

Q And you would agree that Points A and Point D do talk, do address, protective action guidelines that don't necessarily involve the life-threatening doses; only C addresses immediate life-threatening doses.

A You said A and D are what we're referring to?

A really doesn't really have a great deal to do with emergency planning.

Q Let's just focus --

A I tried to explain that in the testimony.

Q Well, let's just focus on D, then.

That does focus on the PAGs, not just --

A Yes.

Yes, within 10 miles. Fairly well.

Q Now, also in your testimony you discuss the least likelihoods for release catagories of PWR 1 to 3; on page 18 of your testimony you say that these release categories are not very different from Surrey and Sequoyah.

And I also was noting that -- your reference to NUREG CR 1131 data which you have as Figures 5.2, 55.3, 5.9 and 5.10, appended to your testimony.

You have focused on certain of the release categories, particularly -- I think you said earlier in cross-examination you addressed PWRs 1 through 5 curves separately.

Now, would you agree that -- let me back up a second.

In your testimony you do note that NUREG 0396 which services as the basis for the planning for the entire radius of the EPZ does rely in turn upon the NUREG CR 1131 analyses.

And part of those analyses were represented by the curve, the curves that are shown in Figure I-11, which is represented in NUREG 0396; but others -- that includes all the release categories, PWR 1 through 7?

A Right.

Q So you would agree -- those other figures from NUREG CR 1031 were also considered by the authors of NUREG 0396; you would agree to that, wouldn't you?

A Yes.

Q It's all part of their consideration.

A Yuh, they do appear, for instance, on page I-46 of NUREG 0396 in slightly different form, in that the authors

of 9396 are addressing the PAG.

Q So you would agree that in arriving at the 10 mile EPZ the authors of 0396 did consider all the different curves, and you have considered them broken down from PWR 1 through 5 and 6 and 7, and also altogether; you have also considered this?

A I would be surprised if they had not been.

Q And then do you have problem -- strike that.

I would like to turn to a reference to yours of warning signs which --

A What page is that on?

Oh, page 14.

Q Now, there what you are talking about is the question of whether emergency planners, or those persons charged with taking protective actions in emergencies would have in fact the time to take action from the time of release t time that the plume would be a particular distance from the plant.

And you're talking about times prior to 10 hours at the top of page 15, for example.

ENDT15JRB
Joe fls

A If I recall, the five to ten hours begins at accident initiation. What is really critical is the amount of time between awareness, at least potential for a core melt, and the time a release would occur. That was studied in one of the other studies that I had referenced. It turned out to be very, very important.

Q Back on page 14, is that study NUREG 0773 that you are referring to, or is this some other study?

A Well, 773 gives the warning time for some of these categories. Specifically for an ice condenser plant.

Q Okay. So we are talking about the time of initiation of an accident until the plume reaches a particular population. These are the number of hours you were talking about?

A Give me one minute. Yes. Accident initiation until the plume travels up. As I indicated, that seemed to be where the bulk of the sequences I looked at came out. There were some that were sooner than that, and some a good bit later.

Q What I would like to focus in on is the problem that you identified that you wouldn't have all of that time available because of delay in detecting the existence of the accident. That is the point you are trying to make.

A What I tried to indicate was that perhaps the warning times in 0773, and for that matter the warning times

that went into the Surry base calculations were probably a bit pessimistic.

In other words, you would have a little more time than perhaps the authors of the Reactor Safety Study though in '75, and that is because of some changes in the post-TMI, emergency action level criteria, which attempt to get the plant operators and plant management moving toward declaring an emergency sooner than they would have under the former set of procedures.

And this would tend to help maximize the amount of time you have available.

Q Would you also agree that as a result of the TMI action plan,particularly NUREG 0737, Supplement 1, NUREG 0737 calls for various upgrading of equipment. Things like the safety display parameters system. The reactor vessel liquid indicator system, and things like that, that in fact the equipment and upgraded training that now exists, that is available to operators in a control room has improved the ability to detect precursors to an accident than the initiation of an accident?

A I think so, yes.

MR. JOHNSON: Thank you, Mr. Sholly. Mr. Riley?

MR. RILEY: Mr. Johnson?

BY MR. JOHNSON: (Continuing)

Q On page 2 of your testimony, you refer to some

information that was found in NUREG/CR 2239. I believe it is found on page C-6. And your statement is siting guidance study, NUREG/CR-2239, specifically projects for the Catawba Plant 100 mean early fatalities for an SST-1 accident and release and 710 mean early injuries.

Do you see that?

A (Witness Riley) I do.

Q There is a footnote on page C-2 with respect to the table that has that information in it. The Table being C-1, that you are referring to, is that correct?

A That is correct.

Q And part of that footnote says, if I may read it, Caution should be used when applying these numbers. The probability times consequence is not an adequate representation of risk. It provides only a common measure for comparative purposes, i.e., the ranking order. The complimentary cumulative distribution function showed in Figure C-1 through C-18 are a better representation of risk.

That is the footnote on that table that pertains to the numbers that you have in your testimony, is it not?

A It is.

Q Would you turn to the CCDF for Catawba, which appears on page C-7?

A C-9?

Q I am sorry. C-9. There are three CCDFs on that

page. The first one on the left is for early fatalities, and is conditional upon SST-1, correct?

A That is right.

Q And if you look at the key, Catawba is represented by a little plus. That is the way you would identify the line on that CCDF that represents the information pertaining to Catawba?

A That is right.

Q Okay. Now, if you look at the number, the place on that CCDF which represents 100 early fatalities, that would be ten to the two, is that correct?

A That is correct.

Q If you read up that line, the plus mark, and then you read over to the scale of probability, what number do you get?

A Somewhere between thirty and forty.

Q I find it is in the neighborhood -- if you read up from the 10 to the minus two, that is 1 times ten to the minus two; the next hashmark is two tames ten to the minus two, three times ten to the minus two, four, and five.

I get five times ten to the minus two.

A I should have said between forty and fifty. You will note that the key for Kelway is right on top of the small mark which represents 30, and I missed that. So I would agree with your 50, yes.

Q That -- five times ten to the minus two is not fifty. Isn't it .05?

A Well, that is .05, yes.

Q The probability that is associated with 100 mean fatality -- one hundred fatalities, is actually .05 is that correct?

A That is right. That would be a five percent probability.

Q Now, if you will look at that CCDF and you look at the entire range of it, doesn't it show that although the mean early fatalities might be, based on the other tables, one hundred, that the median would be far lower. A far lower amount. What you have is a skewing of the absolute numbers of fatalities down at the very improbable level of -- down to ten to the minus three, and that is a conditional probability based on Carmel, which itself is in the area of ten to the minus five. Would that be a fair statement?

A That would be a proper interpretation of this draft. I think the question I would like to respond to though is whether I consider this a valid indication, and I would have a few observations to make about that.

The reason a value of a 100 shows up in the table that we first discussed is almost certainly due to the very high consequence levels in worst accident, and as you

16-6-Wal

pointed out, that raises the mean value.

We are dealing with the median of askewed distribution. It gives us a relatively lower value here though they express it in somewhat different terms.

I have a series of reservations. I feel that the consequence estimates that have been made for the various accident scenarios are largely plausible because we are dealing with things that can be measured. We are dealing with core inventories. We are dealing with conceivable release mechanisms. I won't go into the details.

But the part of risk that is, in my judgment, extremely uncertain is the probability of occurrence; as the footnote that you referred to indicates, not everyone would take as a definition of risk the product of probability and consequences.

I am one of those people who has those reservations. You correctly translate the material on this printed page. I personally do not accept it as valid.

Q Then why did you rely on it in your testimony?

A I did not rely on it in my testimony. I gave it as a for-instance of what had been reported by Sandia Laboratories. If you will go further in my testimony, you will see a discussion of probability in the terms that I just cast.

Q I understand. Have you performed any of your own

16-7-Wal

probability risk assessments?

A Because I believe in the reliability of --

Q Please answer my question first, and then you can explain.

A I will, Mr. Johnson. The answer is, 'no.' And the reason is this. Where you have a clear cut postulational system, like in dice rolling, coin tossing, card drawing, I believe in the validity of the conclusions that are drawn by mathematical analysis.

With respect to the likelihood of accidents where there is a large experiencial base, as with respect to the incidents of fires in community, consequences of frequency of automobile accidents and so forth, again, I think we are dealing in something that is pretty reliable, even though it is not a postulational system. You have a lot of empirical evidence to support it.

I totally distrust the conclusions that are drawn here, and I have already indicated some of the basis for doing it. That is that the agency and the industry were unable to call their shots before the event regarding Browns Ferry, TMI. All you have to do is pick up the file of investigation and enforcement bulletins, and technical informations, to see that this is a very imperfect industry with a whole series of events continually occurring that should be disturbing to it and are disturbing to me.

16-8-Wal

For that reason, I utterly reject the risk concept that is used here, and the probabilities that are devised and I emphasize the word, 'devised' in arriving at these spuriously low numbers.

Q So you don't put much faith in the Sandia Study?

A It depends on the part, Mr. Johnson. I just indicated that I think the consequences section has a great deal of reliability.

I notice that the authors of the Sandia Study are as reluctant to commit to the NRC's risk concepts as I am, because going back to the footnote which you referred to a little bit earlier, it cites in the paragraph before the one that you read, that if one assumes certain probabilities which are promulgated by the NRC would show up as the symbols P-1, P-2, and P-3.

Then you would, accepting that definition of risk, as a product of consequences and probabilities, have these specific risks. So, I would say that the Sandia authors have demurred by not using those numerical values, but by representing as a symbol what they might be.

Q I would like to ask you to make one other observation about that CCDF before we turn to something else.

A All right.

Q I would just like to focus on the first point,

16-9-Wal

the furtherest to the left in that graph, where you have the vertical line 0, and the Catawba CCDF which crosses the vertical axis at just below ten to the minus 1. I guess it would nine times ten to the minus two. Does that not mean there is less than a ten percent chance of one early fatality conditional on the SST-1?

A It means that this particular projection is that there is about a nine percent probability. Now, I might note that the reactor is a little bit smaller. It is 1120 megawatt rather than 1150. That is a rather small demur.

A (Witness Sholly) Something very important, it presumes summary evacuation uniformally for each site, which is thirty percent, forty percent, thirty percent waiting of three sets of emergency response. You evacuate radially away from the site at ten miles per hour, with delay times of one, three and five hours.

So not only are those results conditional on the release occurring, they are also conditional on the emergency response.

Q But we are talking about evacuation of the ten mile EPZ.

A With the distribution of times and speed that I mentioned, yes.

JUDGE MARGULIES: Mr. Johnson, at an appropriate

16-10-Wal

breaking point in your examination, we will take a twenty minute recess.

MR. JOHNSON: Okay.

MR. GUILD: I believe Mr. Twery had something to add, Mr. Johnson?

MR. JOHNSON: If Mr. Twery wants to say something, his counsel can ask him.

BY MR. JOHNSON: (Continuing)

Q Mr. Riley, if you look at your 19,000 fatalities that you referred to later on on page 2, that is derived from the FES, Table 5.11, is it?

A (Witness Riley) That is correct.

Q What are the associated probabilities of that number.

A The alleged probability is ten to the minus eight per reactor year . I might just say in passing that if are looking at the whole forty year per unit life of two units, even that number can be brought down to ten to the minus six.

MR. JOHNSON: I think this is an appropriate point to stop.

JUDGE MARGULIES: We will take a twenty minute recess.

(Short recess taken)

#17-1-Sue

(Whereupon, the hearing is again in session at 4:11 p.m., this same day.)

JUDGE MARGULIES: Back on the record. You may continue with the examination.

MR. JOHNSON: Thank you, Mr. Chairman. I have just a couple more questions for Mr. Riley and then I will switch to Mr. Twery.

BY MR. JOHNSON: (Continuing)

Q Again, on Page 2, Mr. Riley, you refer to several values in your testimony. It says you refer to forty-four thousand persons exposed to 200 rems, two hundred and seventy thousand persons to be exposed to over 25 rem. Those are references to Table 5.11 in the FES.

And you also referred, as we noted, to nineteen thousand early fatalities associated with a tenth to minus eight probability per reactor year, from Table 5.12 of the FES.

Now, is it your position that emergency planning ought to be based on these peak values?

A (Witness Riley) I will try to give an answer. It's a qualified yes. Let's take a look at emergency

#17-2-SueT1 planning for other situations where there is a certain risk that can be life threatening. One of these things has to do with taking a trip in a boat.

Now, the probability of a boat hitting an iceberg, colliding with another vessel or being capsized in a hurricane or something like that is pretty low. But it's a standard practice accepted in society, and not opposed as far as I know by any ship owners, if you have enough life jackets for all on the boat and a surplus usually of life rafts and life boats, they respond to the ultimate life threatening accident.

All right. Let's take a look at airplanes. There was a time when people went up in the airplanes and wore parachutes. There is a commercial conflict that putting parachutes out for each passenger and crewmen, because that interferes with pay load. You can carry less people. It also is very bad for image. It says you might have to use this.

And so parachutes disappeared from the scene. And we do see a certain number of airplane deaths in major crashes, some of which might have been averted by parachutes, others which certainly could not have been.

#17-3-SueT

What we do find, however, is on aircraft that make trips over water, even a limited amount, there are life rafts present. So if the plane is ditched there won't be as much probability of death by drowning.

When we take a look at automobiles, the National Transport Board I believe is very much of the idea that you should be able to undergo, without killing the passenger and the driver, at a thirty-five mile impact into an immovable object. Though this is not representative of the extreme velocity the car can get it is representative of a pretty substantial speed that a lot of cars travel at.

So, to give my answer to your question, because we do know that the potential is there for the consequences, because we do know the inventory of a single core exceeds ten million curies before there has been much of a decay process -- in fact, it approaches twenty million if you include that ten million in your consideration -- I feel it is quite appropriate that since the only thing that is involved is emergency planning for Charlotte, which is a relatively small thing, that we should have it, particularly in view of how cheap it can

#17-4-SueT

come in comparison to the approximate four million dollar cost of the plant.

Q Thank you. Okay, Mr. Twery, the next question is for you. On Page 2 of your testimony, there was some discussion with Mr. McGarry about your sector and what likelihood of the plume blowing in that sector was. And your original testimony said five percent. And then you corrected that to say twenty point five percent.

And then in questioning by Mr. McGarry, you pointed out that you had errors in placement of the sector, the fact that the probability of the plume or -- I guess we are talking about, is it probability of the plume passing in that sector?

A (Witness Twery) Yes. We are talking about which angle the plume would be moving due to wind.

Q Okay. Due to wind. If we, in fact, use the five percent which your sector is associated with, is associated with your sector, in the information Mr. McGarry mentioned, and you multiply the number that you used for the entire circle which was one point -- I'm sorry, point one seven six --

A Excuse me. I just want to see if we are going

#17-5-SueT

to be discussing this. The one problem would be that I was shown Duke's figures for '75 and '77, and I don't know if that's exactly where these figures that were in the Final Environmental Statement --

Q Subject to check, I believe that they are.

A Okay.

Q But if you would multiply point zero five times point one seven six, what number would you get?

A I don't have my calculator with me. I'm sorry.

Q Would you accept that the number would be point zero zero eight eight, and not point zero three five?

A I'm sorry. We are saying if I multiply point zero five times --

Q Point one seven six.

A So, it's about zero zero eight eight, yes, sir, if that arithmetic is correct.

MR. GUILD: Is counsel aware of the correction to the testimony? Mr. Johnson?

MR. JOHNSON: Yes.

MR. GUILD: It's not point zero five. It was

#17-6-SueT1

corrected to twenty point five. And if you want to take into account the variation of the sector Mr. McGarry and the witness discussed, that may be another matter.

But the testimony, as corrected, reads twenty point five, and it's the product of twenty point five times point one seven six.

MR. JOHNSON: Thank you.

BY MR. JOHNSON: (Continuing)

Q Now, I would like next to move to the Sandia study. Do you have a copy of NUREG 2239?

A Yes.

Q Would you look at the reference you make to Figure 2.7.1-3?

A Could you give me a page reference, please?

Q 2-71. Now, what it says here in your testimony, it says that the Sandia study, NUREG CR2239, Figure 2.7.1-3 estimates that for a reactor of the size of Catawba, the lack of a perfect preparation will increase early fatalities by a factor of over ten for major accident.

A Yes, sir.

Q Now, if you look at the figure that you are

#17-7-Sue

referring to, I believe you probably remember that Mr. Riley referred to the same figure, and noted that a factor of ten difference between the no evacuation line and the best evacuation line -- is that correct, Mr. Riley?

A (Witness Riley) That is correct. Slightly more than ten. But ten will do.

(Witness Twery) For eleven twenty, it's a factor of twenty.

Q Would you agree, generally speaking, with Mr. Riley's conclusion?

A I think that in the line of questioning that we have now that twenty is probably different than ten, or at least since it's a factor.

Q It's a factor of ten still, though.

A To the closest order of magnitude, ten is correct. One order of magnitude would be more correct than two orders of magnitude.

Q Now, the FES, what you are doing here in your testimony is applying an uncertainty or a factor of ten to the information that you have been discussing that is in the FES, so you are applying this lack of perfect

#17-8-SueT

evacuation to the FES data. Now, the FES, if you will look at the Final Environmental Statement --

A Yes, sir.

Q -- for expected -- excuse me, let me just get the page. If I represent to you that the information in the FES Tables 5-11 and 5-13 presume -- or, let's just stick with 5-11. This is where you started.

A Yes.

Q Presumes evacuation ten miles, that that is roughly equivalent to what the Sandia Laboratories study referred to as summary evacuation?

A You are saying that an assumption of the study was that evacuation would be as good as Sandia says, was thinking of when they defined summary evacuation? Summary in Sandia is equivalent to your base case here?

Q Yeah, more or less.

A Okay.

Q Now, if you look at Table 2.7.1-2, on the previous page, the Sandia Study, Page 2-70 [illegible] you look at the line for the megawatt --

A I'm sorry. On Page 70, okay.

Q 2-70.

#17-9-SueT

A Yes, sir.

Q And you look along the line that says for the reactor size 1122, it gives you a comparison for being early fatalities, for best evacuation, summary evacuation, no evacuation. The factor of ten analysis seems to apply to the distinction between best evacuation and no evacuation, but between best evacuation and summary evacuation it's more like a factor of --

A Four.

Q -- four.

A Four or five, something like that. So, if I change my assumption to the one you have just given me, it would be instead of a factor of ten it would be a factor of four or five. Yes.

Q Okay. Thank you.

A (Witness Riley) Might I observe at this point, Mr. McGarry's testimony I believe had to do with conditions of ten miles to twenty-five miles out. You are looking at fourteen miles, and there is no plan for that and there is no evacuation.

Q And we are assuming with the summary evacuation that there is an evacuation only to ten miles.

#17-10-SueT

A That is right. We are assuming that it's in the emergency planning zone as it now exists.

Q That's correct. Now, I would also like to refer Mr. Twery to the CCDFs that I was discussing with Mr. Riley earlier in the Sandia report, NUREG CR/2239 to Page C-9. In connection with that statement that you were just talking about at the bottom of Page 2 of your testimony, with regard to perfect preparation, is there --

A I'm sorry. Before -- in asking me the question could you please make sure that I understand what an SST-1 is?

Q Okay. Mr. Riley, would you want to explain what an SST-1 is?

A (Witness Riley) This is the most severe core melt accident considered in making these various calculations.

(Witness Twery) Would that correspond to the number in Table 5-11, given a probability of ten to the minus seven or ten to the minus eight?

(Witness Riley) Only loosely. It's a different specific accident. Mr. Sholly, I believe, could help us on that.

#17-11-Sue

Q My understanding of these tables is that all of the sequences of Table 5-10 are factored in to the Table 5-11 data. But with their associated probabilities.

Is that your understanding, Mr. Sholly?

A (Witness Sholly) Yeah. The SST-1 was simply to be representative of a very large, very severe release.

(Witness Twery) It would be one of these two probabilities?

(Witness Sholly) If you look on Page 5-80 of the FES, it approximates -- SST-1 approximates event tree or TMLD prime from the Final Environmental Statement.

end #17

Jim flws

A I think you were giving us time to make these SST1?

Q No. The whole point of my going to this page was to ask you about the note that appears on that page C9, and that appears on each page of the CCDS.

A Yes.

Q So is it not true thought that in employing the Sandia study as a source of reference for increasing or decreasing the probabilities of an accident by factors of 10 you would want to consider the Sandia caveat that recent evidence suggests that the source term magnitude assumed for SST1 may be overestimated by a factor if not more?

A I do -- I am not adequately conversant with the definitions being used at all in order to really be able to answer your question.

My first reaction is that since we're a little bit vague on what the probability is as an SST1, Mr. Sholly just said that it might correspond to something that had a probability of 2×10^{-6} or 10 to the minus -- or 3×10^{-6}, something like that; and in the table in the FES, Table 5.11, this is dominated by the event that occurs with probably 10^{-7}, and which occurs only .1 as often; maybe even these orders of magnitude might be offsetting, with the vagueness with which things are set together in my mind; the definitions don't match well enough for me to be able to answer your

question at this point.

Q Thank you.

A I understand there may be something on the other side, though. I understand your point.

Q Mr. Sholly, would you say that would be a reasonable factor to consider?

A (Witness Sholly) What factor is that?

Q The factor of source term magnitude and the CCDFs as being more or less directly proportional?

A For early fatalities, yes.

Q So you would, if you were going to use the Sandia study as a reference for determining probabilities you would consider this note as well as other information?

A I would consider it. I would have to be a little bit less -- have to have a little bit less reservations about it because of the additional work that has been done si then. We got a can of worms here; you know, it's all draft work and a peer review so there's a wide range of possible sources.

One can speculate and say a factor of 10 different, or just change the probability. It's very difficult to say at this point where it's going to all come out.

But it is something to consider.

A (Witness Riley) I would like to respond to that. Several years ago when I was first interested in the

area it was suggested that iodine plateout and formation of cesium iodine reduced the iodine source term, and I believe that the consideration that you've been discussing would tie into that.

Well, that would be a reasonable consideration in an accident in which the containment release or containment rupture occurred considerably after release in the containment of iodine, cesium, and so forth.

On the other hand, in the quick release scenario I don't see that applies.

So I see it being an additional case but I don't see it here.

Q Okay.

One other point, this was brought up in Mr. Potter's testimony; perhaps I'll direct this question to you, Mr. Riley, since you addressed this a little bit ear.

Table 2.7.1-2 on page 2-7 of NUREG CR 2239; do you have that, please?

A I have page 2-71 of --

Q 2-70.

A 2-70. Okay.

Q Now, my understanding is these scenarios are based on a locale of New York City and an evacuation in that environment; is that correct?

A Well, one says, 120 megawatt electric core, radionuclide core inventory scaled to reactor size, SST1

release, New York City meteorology, Indian Point population.

Q Would you say that the population and demography around the Indian Point and the problems of evacuation of the environs of New York City are comaprable to Catawba?

A I might say the population density is probalby higher.

With respect to the prevailing wind direction vis a vis the higher concentrationsof population I would need to refer to materials before reaching a conclusion.

Q You don't know whether it would be more difficult to conduct the evacuation there than at Catawba?

A On the assumption that the region being evacuated would be the region in which the instant meteorology suggested for the plume was going to traverse I'd say I'd have to know that before I could answer.

I can certainly see a case where a plume might traverse a more densely populated region and cause more serious problems.

Q But you wouldn't be sure that this data would be applicable to the Charlotte area?

A I would be reluctant to say so except in a most general way.

MR. JOHNSON: That's all I have. Thank you very much.

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JUDGE MARGULIES: Redirect.

MR. GUILD: Yes.

REDIRECT EXAMINATION

BY MR. GUILD:

Q Mr. Sholly, you were asked a number of questions about the appropriateness of using baseline data from the Surrey plant and the Sequoyah plant and perhaps others as a basis for modeling consequences at Catawba in respect to probabilities in accident scenarios.

What's the difference in design in material respect to the comparison of Sequoyah -- let's make that first, Surrey and Catawba?

A (Witness Sholly) Well, aside from external events, we discussed that before; the type of containment is certainly -- I have not looked recently enough at the numbers of engineered safeguard features: trains, pumps, and piping routes and suction valves and such at the plants. But I am sure those are different in some respects.

But the thing that's most important, I think, is the containment.

Q What's the difference between the containment at Surrey and Catawba?

A Surrey has a large dry subatmospheric type of containment similar to Beaver Valley and a few other plants.

Catawba, of course, is an ice condenser plant, the

containment.

Q What's the difference, significant difference in an ice condenser type and a large dry subatmospheric?

A Well, there are two competing considerations.

One is design pressure of ice condenser plant is lower and the ultimate failure pressure for ice condenser plants are lower.

And at the same time an ice condenser plant has the capabilitiy to some extent to passively cool the steam release from the primary system and also for some fission products -- passivley.

Q Do I understand correctly that it's a thin-shelled containment with a lower ultimate strength than at Surrey, in the order of 15 pounds per square inches of gravity design, say, by comparison to, say, 60 pounds per square inch; is that proper -- general comparative figures?

Maybe I better say: please tell me?

A I am not sure what the specific design pressure of the Surrey containment is; probably in the neighborhood of 40 to 60 pounds, something like that.

Q And 15 for an ice condenser?

A I believe that's correct. Ultimate failure pressures differ by perhaps a factor of 2.

Q And the ice condenser feature as a layperson generally refers to a feature -- columns of crushed ice that

are designed to condense steam when you have a steam line break in an accident, and loss of cooling?

A Yes.

Q And the ice condenser design is to, as I understand it, condense the steam thereby reducing the pressure, thereby mitigating the likelihood of a pressure transient that would breach the containment?

A That's the general idea.

Q And is it a fair understanding that the TMI experience suggests that with a hydrogen -- the hydrogen generation from cladding-water reaction and fuel melt -- the potential was for the first time was presented for containment breach occurring from a hydrogen detonation; it would threaten the ice condenser containment -- it would threaten a containment from an overpressure transient not generated simply by a steam break.

Is that a fair paraphrase of what we learned from TMI?

A I don't think so.

Q Help me?

A Hydrogen burns had been considered in PRA studies before; it showed that you can get a significant amount of hydrogen generated in something less than a full scale core melt; and that's something that's perhaps a little different. That's the main feature.

Q Well, to bring us home, the threat of a containment breach in a hydrogen detonation is one of the most material accident scenarios that would generate an early containment breach and large consequences relevant for emergency planning; is that true?

A It's generally true, but it depends on the specific accident scenario and what systems are functional and what ones are not.

Q You understand that Mr. Potter in his analysis looked at the Sequoyah reactor safety study methodology, RSSMAP, and, if you will, modified its results to take into account certain hydrogen mitigation features that in his view mitigated either probabilities or consequences of various accident scenarios?

A I recall that he did; I don't -- I didn't study his testimony in detail.

Q Mr. Riley, do you have Applicants' prefiled testimony on Contention 11?

A (Witness Riley) I do.

Q I am looking at Mr. Potter's work, it's his attachment, page 7.

A I have it.

Q All right, the bottom of page 7 reads, No comprehensive assessments of core melt release characteristics or probabilities for Catawba plant are available; and

performance of such assessment is beyond the scope of this limited study. Available studies for plants similar to Catawba were used to determine the most appropriate set of release categories. Then there's a parenthetical. Next page, page 8, references 9, 10, and 11. These studies indicate that the core melt release spectrum for Catawba was less severe than that calculated in the RSS, but the studies are not comprehensive enough to permit complete quantification.

Therefore, RSS PWR releases and probabilities were used in this study.

That seems to indicate that, having looked at the others, he goes back and settles on Surrey as the appropriate plant to model for analyzing Catawba accident scenarios?

A That's right.

Q All right.

Now, with reference to Mr. Potter's references that begin at page 14, look a moment at the notes there reflected in that passage; those are References 9, 10 and 11; page 15, Mr. Riley.

Do you see noted in there the Sequoyah RSSMAP as item 9?

A Yes, I do.

Q A work by -- it looks like a gentleman or lady G I E S A K E -- Radionuclides for Specific LWR Accident

Conditions, Ice Condenser Containment Design; that's 10.

And No. 11, Duke Power Company; the title of the reference is An Analysis of Hydrogen Control Measures at McGuire Nuclear Station.

Are you familiar with item 11 the McGuire hydrogen control measure analysis?

A That is dated October 20, 1983; I was involved in a proceeding with respect to the operating license for McGuire, in which I believe there was a very similar title but it had an earlier date.

I am quite familiar with that document.

Q Are you familiar with the hydrogen mitigation measures which Duke has placed or perhaps are in process of being placed at McGuire?

A At that time the system was GM diesel blow-plug system which was manually operated in the control room and in which there were a large number of breaks throughout the containment to reduce hydrogen burn if there were combustible hydrogen there.

Q Now, I understand from Mr. Potter's testimony that consideration of Duke's McGuire hydrogen mitigation analysis led him to conclude that the Sequoyah analysis was perhaps more harsh than one would expect, given hydrogen mitigation; and that was on the basis of his confidence in the reliability of a hydrogen mitigation system that Duke has

in place at McGuire and to be in place at Catawba.

Mr. Riley, do you share his confidence in the reliability of the hydrogen mitigation system?

MR. MC GARRY: Objection.

The functioning of the hydrogen system was a specific contention raised by CESG back in 1981, CESG Contention 2.

I'll read it: A license should not issue until and unless the hydrogen release conseuqences from that range and variety and locus that the Applicant is required by the NRC to consider have dealt with -- h ave been dealt with so as to make impossible damage to public health and safety. The igniter system cannot perform this function.

There was also a Palmetto Alliance Contention 31.

Palmetto Alliance also had a similar one, Contention 9.

All three of those contentions specifically were ruled out by the Board in its December 1st, 1982 decision.

And I have held back for a moment, for a while, it is our view that this line of inquiry goes well beyond the scope of cross-examination; and, indeed, appears to be direct.

For those reasons we object to the question.

MR. GUILD: Mr. Chairman, the matter fairly addresses a point based on cross-examination, focusing on Mr. Sholly's testimony which did use the Sequoyah RSSMAP as the basis for modeling of accident scenarios and consequences for Catawba.

Now, Mr. Potter discounted the severity of the Sequoyah results on the basis of his confidence in the reliability of hydrogem mitigation measures employed at Catawba.

Now, it seems to me it's fair game for Applicants' witness on the subject of accident consequences and probabilities as they underline emergency planning needs for Catawba to say that we do not worry about Sequoyah's areas so much because our hydrogen mitigation is so reliable.

And then it should be fair game for us to direct the question to these gentlemen as to their knowledge and confidence in those same measures, particularly in light of the cross-examination of Mr. Sholly, who said he had not performed an analysis of the reliability of those measures, and di not know, therefore, what specific impact those measures would have on his reliance on the Sequoyah information.

Now, I should add that in fact we have another contention that we now have before Judge Kelley's Board that raises the question of the effectiveness of Applicants'

hydrogen mitigation measures.

The contention previously raised in this proceeding was indeed dismissed. It was dismissed because Judge Kelley had the assurance that the Commission's final rule on hydrogen mitigation would be adopted by the time the licensing of this plant was complete; and, therefore, it made no sense to litigate hydrogem mitigation in this proceeding when there would likely be a final rule in place.

His objection was however that the final rule would be in place some months ago, and, of course, the plant is still under construction; the license has not yet issued; there is no final rule.

But the issue of whether or not the contention itself on the issue of hydrogen mitigation is in or is out, is not the point.

The point is that there's a specific factual underpinning for the testimony of witnesses on this contention that relies on the effectiveness of hydrogen mitigation.

MR. Sholly and members of the panel were asked questions about the effectiveness of the relying on the Sequoyah RSSMAP, without taking into account hydrogen mitigation.

I think it is appropriate that the door having been opened to that subject, that Mr. Riley be permitted to provide the information he has.

JUDGE MAGULIES: How does that bring us to McGuire?

MR. GUILD: That's an excellent point, Judge; the fact of the matter is, though, page 15 of Mr. Potter's work, his refernce is to a Duke Power Company analysis made at McGuire. He applied that to Catawba; Catawba and McGuire are generally speaking asserted by Applicants to be identical facililties in most material respects.

And it is my understanding of his testimony that the mitigation features at Sequoyah and McGuire, and the analysis of those features is directly applicable to Catawba because of the similarity of design. That seems to be Mr. Potter's input. And that is the connection between McGuire and Catawba.

We know of no analysis with respect to Catawba.

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MR. CARR: Your Honor. Excuse me. A point of clarification. The study referenced by Mr. Potter it is true refers to McGuire, but it was amended and in fact now covers Catawba.

JUDGE MARGULIES: The objection is overruled. You may answer.

BY MR. GUILD: (Continuing)

Q Do you recall the question, Mr. Riley?

A (Witness Riley) Would you please repeat it.

Q Do you share Mr. Potter's confidence and reliability of the hydrogen mitigation features, such that they can be relied upon to mitigate the accident scenarios described in the Sequoyah RSSMAP, for example?

MR. McGARRY: Objection. In the McGuire proceeding, Mr. Riley attempted to testify on this subject matter as well as other subject matter, and his testimony was not permitted by the Board because he wasn't competent to testify in this area, and that was upheld by ALAB 669.

MR. GUILD: Mr. Chairman, it seems to me that Mr. McGarry has an obligation to raise his objection -- all of his objections, and not just hack away at the witness or at our redirect. If he has an objection, he should state it.

He shouldn't wait until one is overruled, raise another one. Perhaps he has ten or fifteen more he

would like to put on the table for us right now.

But the fact of the matter is the witness' answer should speak for itself. I submit that he has knowledge on the subject. He has been admitted as an expert with respect to the subjects of this contention.

We are not questioning the hardware issue of hydrogen mitigation. We are not trying to rebuild the plant in that respect. We are simply talking about for purposes of analyzing accident scenarios and probabilities, the issue of whether he should rely on this mitigation -- these mitigation measures, period.

JUDGE MARGULIES: Objection is overruled. You may answer.

WITNESS RILEY: Thank you. There are a spectrum of hydrogen release scenarios. It depends on how rapidly the core is getting uncovered. The energy that it has, and how rapidly it heats up.

The amount of coolant that is being added to the system. To answer your question now, there are some circumstances in which I believe the mitigation features that have been discussed would be quite effective, but there is another set of conditions under which they would not be effective. I would like to tell you why.

For hydrogen to burn, heat and pressure, there has to be a certain amount of oxygen with it, and there is

a band of ratios of hydrogen to atmospheric oxygen which are combustible; not all of them detonate. There is a relatively narrow range which detonation could occur, but we are not going into that. Just saying there is a combustible range.

Now, in the Catawba containment, there are several large air circulation fans. The containment is roughly divided into three parts; the upper containment doesn't have much functional gear in it. The middle containment has the ice condenser arrangement. The lower containment has the reactor and the steam generator and that sort of equipment.

Now, these fans are located to take care from the upper containment, and drive it into the lower containment. If hydrogen is being released during an accident, and the fans are on, and the ratio of hydrogen to air is appropriate, mixed with steam this atmosphere will come up through the ice condensers, the moisture will be condensed, and there will be a combustible mixture of hydrogen/oxygen, and it will burn off, and it will be essentially inocuous, and there will be pressure rises. Duke has worked out a series of scenarios on this. Yes, there will be pressure rises.

But the case that is not covered here is the one where there is an oxygen deficiency. Now, there are

several things that can cause an oxygen deficiency.

One is a failure of the air return fans. If the mixture that is present in the lower containment is hydrogen and steam, the steam will be condensed out when it moves over the ice condenser, and the thing that will issue from the top of the ice condenser chamber is essentially pure hydrogen.

Now, essentially pure hydrogen has one-seventh the density of the atmosphere, and it will rise as it issues, and it will go up and come to the top of the containment, at which point it will encounter igniters, and at the front where there is a mixing of the air that was up there with the hydrogen, there will indeed be burning until the amount of oxygen up there has been exhausted in the burn, after which hydrogen will accumulate in the upper containment.

Now, over a period of time gasses difuse, and the lower atmospheric oxygen will difuse into the upper hydrogen layer, progressively generating a combustible mixture.

When that combustible composition reaches the top igniters, there is going to be one very large hydrogen burn. Now, in this case the mitigation device, I agree with Marshall Berban, of Sandia Laboratories, who reported on this subject in the reopened McGuire proceeding, under these

conditions, the mitigation device will work in a counter productive way, and cause an accident that otherwise might not have occurred, and a severe one.

It would depend upon the amount of zirconium 10 sheath that was consumed in the steam reaction as to how severe the pressure rise would be.

Research Associates, commissioned by the NRC to make a study, said that for a hundred percent of the so-called metal water reaction,the peak pressure would be without mitigation a hundred and ninety-one psi. And we know how that compares to the various numbers that have been talked about for the ultimate strength of the containment.

Q Mr. Sholly, in your examination, I believe you observed that the reactor safety study dismissed the significance of external events as causal sources for important accident scenarios, and that you observed a site specific analysis of the significance of external events was important, in your judgment, for emergency planning accident analysis. Could you explain please?

A (Witness Sholly) Yes. There are combinations of failures which might occur through external events that would not necessarily occur in the same way and under the same degree of possible recovery for internally initiated accidents. A good example would be a relatively

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severe earthquake that would knock out offsite power. And this occurs at fairly low acceleration, and would also snap fuel lines leading to the diesel generators. Such a condition would leave you in a station blackout, essentially unrecoverable within any reasonable period of time, and would render your mitigation systems ineffective.

That is just an example of the sort of thing that would need to be examined in an external event analysis.

Q Such an external event then could disable both the blow plugs and the hydrogen mitigation system, as well as the recirculation fans that are designed to circulate the hydrogen and containment atmosphere.

A The example that I gave you would effectively disable any equipment that relies on AC power.

Q Mr. Twery, does the specific percentage of wind prevelance in the sector depicted as covering your place of residence materially alter the results of your analysis?

A (Witness Twery) If I could enlarge on that. I would like to thank Mr. McGarry and Mr. Johnson for making me a little bit smarter about what figures I perhaps should have used if I wanted to do the analysis that I had. They leave me with still some questions of resolving definitional matches between separate reports,

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and at this point, having been made smarter, if I did use exactly the same logic that I used then, had used originally in my testimony, what I probably would have done was to have calculated the expected number of people with an excess of 200 rem exposure in the proposed extension of the EPZ into Charlotte, and if I did that and I stated that instead of refraining myself just to the specific sector that I am in, then the total probabilities instead of being the twenty point five percent that I had named, would have been certainly in excess of twenty-five percent, using the figures in the Duke report and the answer would have come out even bigger.

Also, while listening to the comments I heard, went back and actually calculated expected value instead of just using the one line contribution to expected value. As uncomfortable as I also feel in using expected value, I don't see any alternative to do so except that are used in the concept of utility to get us bigger confrontations and disagreements.

The actual expected value, and considering eighty reactor years, and considering the wind in general blows in the direction of southern Charlotte, give me at least twenty-five percent of the time if we are talking about all of southeast Charlotte, that the relative population density is about ten times what is in Charlotte --

southeast Charlotte is larger five to ten times as much as it is in the disc altogether, that if I am talking about injuries instead of talking about early fatalities, then I still think the ten to one hundred figure in the report is, if anything, conservative, and if I said take preparation, less than perfect preparation into account, then maybe I will cut my factor of ten down to five, what I end up with is seventeen to a hundred and seventy-five is the expected number of people with at least two hundred rem exposure in Charlotte segment of the EPZ as being what we would expect in the forty years life for the reactor, ignoring any interaction to the fact that you have two reactors sitting one next to each other, which I haven't heard anybody talk about up to now.

So the conclusion I come to is that there is -- that I am concerned in more than the forty year anticipated life of the reactor. There is more than just a fractional person that we expect to have a considerable dossage of radiation, and whatever way you figure economics, that has to be a matter of millions. I would guess any way you figure it, two million on the low side, a couple of hundred million on the high side, maybe fifty to a hundred million was where we would agree on a accident the most likely range would be if we argued that one through.

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I have had myself made smarter on each of the numbers that I put in. I still have some questions, but I find my conclusion being exactly the same as originally given in my testimony using the smartiness that I have gotten to, admitting that I am not perfectly smart in all the technical pertinence and all the definitions, conflicting definitions, to the extent that I have heard today.

MR. GUILD: Thank you, gentlemen. Mr. Chairman, that concludes my redirect.

JUDGE MARGULIES: Are there any other questions?

MR. McGARRY: Yes, Your Honor.

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RECROSS EXAMINATION

BY MR. McGARRY:

Q Mr. Sholly, the plans which you referenced, which considered external events, was the core melt frequency significantly different from that set forth in WASH 1400?

A (Witness Sholly) Yes.

Q What is the core melt frequency in WASH 1400?

A For the PWR, it is roughly one in sixteen or seventeen thousand.

Q One --

A One chance in sixteen thousand to seventeen thousand per reactor year, like five times ten to the

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minus 5th or something.

Q Will you accept six times ten minus five?

A Sounds good.

Q What types of frequences were you getting for core melt in these plants you referenced? Sequoyah, Zion, Seabrook, Indian Point?

A Some of these were in the range of a few times ten to the minus four.

Q Would you say the difference between six times ten to the minus five, and a few times like one point four times ten to the minus four is significant?

A I don't know where you got the one point four from, but it is something between factor five and ten, and it is potentially significant. It depends on what the effect of those particular accidents are on engineered safeguard features. That is very important.

Q Have you performed any analysis of Catawba external events, and how they would affect either the core melt frequency or the RSSMAP release frequency?

A No, sir.

Q Thank you.

RECROSS EXAMINATION

BY MR. JOHNSON:

Q I have one question, Mr. Sholly. Again, this is on the subject of external events. The main consideration

or primary consideration that you talked about with respect to external events was an earthquake that leads to the loss of all AC power.

A (Witness Sholly) I used that as an example.

Q Isn't it true though in accident TMLB prime which was considered in the reactor safety study does involve such a total loss of AC power?

A Yes.

MR. JOHNSON: That is all I have.

JUDGE MARGULIES: Are there any other questions of Mr. Sholly? There being no further questions, the panel is excused. Thank you.

(Panel stands aside.)

MR. McGARRY: Are we still on the record?

JUDGE MARGULIES: We are still on the record. We are scheduled for tomorrow Staff's presentation of their direct testimony on Contention 11. The way we have schedule that, if my recollection is correct, was for half a day. We will take up the matters of the subpoenaed witnesses following the presentation of Staff's direct testimony.

We will recess until tomorrow morning for the evidentiary hearing. Until 9:00 tomorrow morning. We will have a limited appearance hearing here in this room starting at 7:00 o'clock and we will continue until we run

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out of witnesses, with a termination time of nine p.m.

(Whereupon, at 5:10 p.m., the hearing was adjourned, to reconvene at 9:00 a.m., Friday, May 25, 1984.)

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CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the NRC COMMISSION

In the matter of: DUKE POWER COMPANY

Date of Proceeding: May 24, 1984

Place of Proceeding: Charlotte, North Carolina

were held as herein appears, and that this is the original transcript for the file of the Commission.

James Burns
Official Reporter - Typed

James L. Burns
Official Reporter - Signature

Myrtle Traylor
Official Reporter - Typed

Myrtle Traylor
Official Reporter - Signature

Garrett Walsh
Official Reporter - Typed

Garrett J. Walsh, Jr.
Official Reporter - Signature