NUCLEAR REGULATORY COMMISSION

ORIGINAL

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:

CONSOLIDATED EDISON COMPANY OF NEW YORK (Indian Point Unit 2)	:	DOCKET NO. 50-247 SP
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point Unit 3)	:	DOCKET NO. 50-286 SP

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ADD: E. GREHER
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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

4 -x

5 In the Matter of: : Docket Nos.:

6 CONSOLIDATED EDISON COMPANY OF NEW YORK :
(Indian Point Unit 2) : 50-247 SP

7 POWER AUTHORITY OF THE STATE OF NEW YORK :

8 (Indian Point Unit 3) : 50-286 SP

9 -x

10 Ceremonial Courtroom
Westchester County

11 Courthouse
Grove Street

12 White Plains, N.Y. 10601

13 Friday, July 9, 1982

14 The hearing in the above-entitled special

15 investigative proceeding was convened, pursuant to

16 recess, at 9:02 a.m.

17 BEFORE:

18 LOUIS J. CARTER, Chairman
Administrative Law Judge

19 OSCAR H. PARIS

20 Administrative Law Judge

21 FREDERICK J. SHON
Administrative Law Judge

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1 APPEARANCES:

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12 E X H I B I T S

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21 RECESSES:

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1 P R O C E E D I N G S

2 JUDGE CARTER: We will go on the record.

3 At the outset I want to clarify my response to

4 a question of Mr. Levin's concerning the Board's July 6

5 order on discovery at Part III. As the order states,

6 all objections on discovery matters will be accepted

7 each Friday, but this was not meant to preclude a

8 written objection. It is always helpful to provide the

9 Board with verbatim copies of the interrogatory and

10 answer, if any, to the questions, as well as any

11 citation. In the latter case, a photocopy of the

12 pertinent part of the decision cited can be of

13 assistance.

14 I just wanted to make that clear.

15 Mr. Brandenburg, are you ready to proceed with

16 your cross examination?

17 MR. BRANDENBURG: Yes I am, Mr. Chairman.

18 Whereupon,

19 JOHN BEYEA

20 and

21 BRIAN PALENIK,

22 the witnesses on the stand at the time of recess,

23 resumed the stand and, having previously been duly sworn

24 by the Chairman, were examined and testified further as

25 follows:

1 CROSS-EXAMINATION -- RESUMED

2 BY MR. BRANDENBURG:

3 Q Dr. Beyea, yesterday Mr. Kaplan, while

4 questioning you, was somewhat exercised about the

5 northerly winds and the figure of 18 percent was

6 mentioned.

7 What I would like to do this morning initially

8 is to go over with you the meteorological assumptions

9 that underly the conditions which you modeled in Tables

10 3, 4, and 5 of your testimony which appear on pages 30,

11 32 and 34 respectively.

12 Am I correct, Dr. Beyea, that in each of those

13 instances the assumptions which you are modeling are a

14 Pasquill D stability class situation?

15 A (WITNESS BEYEA) That is correct.

16 Q And an 8 to 12 mile per hour or roughly 4

17 meters per second wind speed?

18 A (WITNESS BEYEA) That is correct.

19 Q And a northerly wind, is that correct?

20 A (WITNESS BEYEA) I believe we show winds in

21 both directions on those tables.

22 Q That is correct. In one of the tables you do

23 have a northerly wind. I stand corrected. Thank you.

24 In the instance of the 18 percent that was of

25 so much interest to Mr. Kaplan yesterday, was that

1 strictly a northerly wind, or does that include
2 northwesterly winds, northeasterly winds, et cetera, and
3 so forth?
4 A (WITNESS BEYEA) That was a wind coming from
5 the north that was -- it was a wind coming from the
6 north such that the wind direction lay within a 45
7 degree angle. In that case, part of the plume would
8 have crossed part of New York City.
9 Q Now, all else being equal, what would be the
10 effect of the existence of a Pasquill stability class A,
11 B, or C condition during the time of the release on the
12 Tables 3, 4, and 5 of your testimony?
13 A (WITNESS BEYEA) It is difficult to make a
14 precise statement without looking at the computer
15 codes. My rough estimate is that they would tend to
16 decrease the numbers because the average population in
17 the wedge would be smaller. So there would be some
18 decrease in the numbers for the wind blowing from the
19 north toward the New York City area.
20 Q Again, assuming all else being equal, which is
21 a substantial assumption, to be sure, but assuming all
22 else to be equal, would the plume rise be greater and
23 the diffusion more pronounced, and therefore the dosage
24 lesser under Pasquill stability classes A, B, and C than
25 under the D stability class which you modeled?

1 A (WITNESS BEYEA) It depends on the distance
2 you are from the plant. In the region within 10 miles
3 the doses might very well be higher under A, B, and C
4 because the plume might be brought closer to ground. In
5 the direction beyond 10 miles, talking about New York
6 City, the average dose would tend to be less. The
7 population dose, however, which is relevant to the
8 calculation of cancers, would not be that much less. It
9 would be lowered by the effective population density in
10 the larger wedge.
11 I might add that as we mentioned the other
12 day, the D and E stability classes which we model here
13 occur about 70 percent of the time.
14 Q Dr. Beyea, the data base which you used on the
15 meteorological historical data in modeling your
16 consequences appeared in which document? It was an EPA
17 document, I believe?
18 A (WITNESS BEYEA) The meteorological data --
19 let me start again. We looked at a number of documents
20 which have meteorological data, including the safety
21 analysis reports at Indian Point, including -- I don't
22 recall an EPA document, and we also did look at a
23 compendium prepared for the benchmark study.
24 JUDGE PARIS: Dr. Beyea, while Mr. Brandenburg
25 is considering his next question, could I ask something

1 to clarify my understanding of something you said a few
2 minutes ago?
3 If the wedge is wider when it reaches New York
4 City because of meteorological conditions, the average
5 dose per person would be lower, is that correct?
6 WITNESS BEYEA: That is correct.
7 JUDGE PARIS: But the total population exposed
8 would be greater, is that correct?
9 WITNESS BEYEA: No, it would not be greater --
10 yes, yes, I'm sorry. The total population exposed would
11 be greater.
12 JUDGE PARIS: And so I thought I heard you say
13 that because of the population exposed in the wider
14 wedge, the population dose would tend to go down.
15 WITNESS BEYEA: Let me try again. If there
16 were uniform population density, suppose the population
17 were absolutely uniform per square mile, then to first
18 order there would be no difference. It would not depend
19 on the wedge angle because the average dose would drop
20 and the exposed population would increase as you
21 increase the wedge. But actually, in New York City, the
22 population density is not uniform. It tends to be more
23 concentrated close to the -- close to Manhattan. So
24 when you do the calculation, you must use an average
25 population density. And what I am saying is for an A

1 type wedge, a wider wedge, the average population
2 density is lower than for a D stability population
3 wedge, but it's not a big factor. It might be a factor
4 of 2. It is not an enormous effect.
5 JUDGE PARIS: So go ahead and follow through.
6 What does that mean?
7 WITNESS BEYEA: So I think what that means is
8 that if you did a similar table using A stability class,
9 you would get somewhat lower numbers for the total
10 number of excess cancer deaths.
11 JUDGE SHON: Is there not also a change due to
12 sigma in the other direction that would also lower the
13 average dose?
14 WITNESS BEYEA: We have assumed, however, in
15 these calculations a mixing layer which is independent
16 of stability class so that by that time the plume is
17 pretty well mixed through the atmosphere. But I guess
18 you are right, it may not be completely mixed for the D
19 stability class. So I would say to get a precise
20 answer, one would have to go back to the computer and
21 look at how big an effect the vertical spread had.
22 JUDGE SHON: There are also second order
23 effects.
24 WITNESS BEYEA: I think at 35 miles they are.
25 Within the 10 miles on the first order effects, then

1 they might be very important, and you cannot make
2 blanket statements without looking at the model.
3 JUDGE SHON: At 35 miles or more you are
4 getting to the point where you are losing more on one
5 and you gain on the other.
6 WITNESS BEYEA: I think so, yes.
7 JUDGE SHON: I think so, too.
8 BY MR. BRANDENBURG: (Resuming)
9 Q Dr. Beyea, is it your understanding that the
10 mixing layer is independent of stability class?
11 A (WITNESS BEYEA) Strictly speaking it is not,
12 it is not, but in our modeling we did not vary the
13 mixing layer with stability class. In our calculations,
14 it was not important, however. If we had gone to A
15 stability class, then I think we would have had to take
16 that into account.
17 Q Now, while the Board was asking you a question
18 or two, I located the reference to the meteorological
19 historical data which you employed in modeling your
20 consequences, and I believe it is from a draft
21 environmental statement dated October 1973, prepared by
22 Consolidated Edison Company, is that correct?
23 A (WITNESS BEYEA) That is one of the documents
24 that we used, and I think there is a table in that
25 report, in our report which does use the 1973 PSAR. The

1 18 percent number was taken from -- may I just take a
2 pause here?
3 (Pause)
4 A (WITNESS BEYEA) The 18 percent number is an
5 average. 17 percent we took from the benchmark study;
6 19 percent from the safety analysis report.
7 Q What is the data base for the benchmark study,
8 Dr. Beyea?
9 A (WITNESS BEYEA) It is my understanding that
10 it is taken from the meteorological tape at Indian Point
11 that was used in the reactor safety study.
12 Q It is your understanding that meteorological
13 data from Indian Point was used in the reactor safety
14 study?
15 A (WITNESS BEYEA) Yes, that is my
16 understanding, or at least the tape was available for
17 the reactor safety study.
18 Q Now, the data base you employed or expressed
19 as annual frequencies of occurrence, is that correct?
20 A (WITNESS BEYEA) That is correct.
21 Q Now, respecting wind direction -- I'm trying
22 to return to Mr. Kaplan's 18 percent again -- what is
23 your understanding of the degree of sector by which
24 frequencies were expressed in this data base? In other
25 words --

1 A (WITNESS BEYEA) They were expressed in 22 1/2
2 degree.
3 Q Now, if the 18 percent was arrived at by
4 summing wind distances in a 45 degree sector, which two
5 sectors did you combine to arrive at 45 degree, which
6 two 22 1/1 degree sectors did you combine to arrive at
7 the 45 degree angle of frequency number of 18 percent?
8 A (WITNESS BEYEA) That would be the two sectors
9 on either side of -- no, excuse me. My assistant says
10 no.
11 A (WITNESS PALENIK) It would be the sector
12 directly south and one sector to the I guess east of the
13 plant, east of that sector.
14 Q So the 18 percent number was obtianed by
15 summing the annual frequency of the northerly wind
16 sector and the north northeast 22 1/2 degree sector, is
17 that right, or is it rather the northerly sector and the
18 north northwest sector?
19 A (WITNESS BEYEA) While my assistant is
20 clarifying this terminology problem that we always have
21 about which way the wind is blowing, whether it is from
22 the north or towards north, let me just point out to the
23 Board that if the wind were completely random, there
24 would be a 12 1/2 percent chance, if the wind were
25 blowing uniformly in all directions, there would be a 12

1 1/2 percent chance of blowing in the 45 degree sector.

2 A (WITNESS PALENIK) From the weather data in

3 the draft environmental statement, we used the sectors

4 for the wind blowing toward the south and toward the

5 southeast, excuse me, south southeast.

6 Q So I understand for purposes of obtaining the

7 18 percent, you have summed the annual frequency data

8 for northerly wind direction. I am referring to wind

9 from the north which I understand is the normal

10 meteorological practice, and also the annual frequency

11 data for wind in the north northwest 22 1/2 degree

12 sector, is that correct?

13 A (WITNESS PALENIK) Yes, that is correct.

14 Q Now, is it your understanding that wind from

15 the north northwest direction sector would, as you

16 modeled this hypothetical accident with its 7 1/2 degree

17 swath, carry the plume over the city of New York?

18 A (WITNESS PALENIK) It would carry the plume

19 through parts of the city of New York.

20 Q As you sit here, Mr. Palenik, I realize I'm

21 asking you to make a generalization. Which portion of

22 the city of New York do you envision would be exposed to

23 a plume traveling from the north northwest 22 1/2 degree

24 sector?

25 A (WITNESS PALENIK) It would be parts of Queens

1 and possibly Brooklyn.

2 Q Thank you.

3 In Tables 3, 4, and 5 again of your prefiled

4 testimony, Dr. Beyea, I understood your prior answer to

5 be that each of three factors must simultaneously occur

6 before the meteorological conditions which you modeled

7 would manifest themselves, and that is a Pasquill D

8 stability Class No. 1, an 8 to 12 mile per hour speed

9 class, wind speed class No. 2, and a northerly or I

10 gather north northwesterly wind circumstance No. 3, is

11 that correct?

12 A (WITNESS BEYEA) That is correct for those

13 tables. However, the frequence of occurrence of other

14 conditions which are equivalent or worse is greater and

15 is discussed in a table in our text.

16 Q That is Table 9, I believe, is that correct,

17 page 57, Dr. Beyea?

18 A (WITNESS BEYEA) Yes, that is correct.

19 Q Can you tell us, Dr. Beyea, what percentage of

20 the time during the year of data base which you used in

21 employing, or in preparing, rather, Tables 3, 4, and 5,

22 those three circumstances, that is D stability class, 8

23 to 12 miles per hour speed class, northerly winds,

24 simultaneously occurred?

25 A (WITNESS BEYEA) The combined frequency that

1 you mentioned occurred about 2 percent of the time.
2 Again, I point out that there are other conditions which
3 are equivalent which occur, of course, with higher
4 frequency of occurrence.
5 Q Now, Dr. Beyea, in your modeling, in order for
6 the plume to reach New York City, under the assumptions
7 which you made, does not the wind direction have to
8 remain constant from the north or north northwesterly
9 directions over the release period as shown in Figure 5
10 on page 39 of your testimony?
11 A (WITNESS BEYEA) Not really. The direction
12 that we pick as a surrogate for more realistic
13 conditions, the wind could, of course, start off in
14 other directions and then shift blowing toward New York
15 City, but in first approximation, it is sufficient to
16 take one direction and assume the wind is moving in one
17 direction.
18 Q Generally speaking, however, your modeling
19 assumptions require the prevailing wind direction
20 throughout the period of the release and the subsequent
21 transport of the plume to
22 be predominantly from the north, is that correct?
23 A (WITNESS BEYEA) Of you are talking about New
24 York City.
25 Q Yes.

1 A (WITNESS BEYEA) All you are concerned about
2 is whether the plume which is released in about a half
3 an hour, actually ends up over New York City.
4 Q Well, is it your understanding, Dr. Beyea,
5 that if a plume first went over into Connecticut, I
6 believe was one of Mr. Kaplan's suggestions, and then
7 changed direction and then perhaps wandered over near
8 Newark and then finally came back to the City of New
9 York, that the concentrations would still be as high as
10 you modeled them in Tables 3 and 4?
11 JUDGE CARTER: Excuse me, Mr. Brandenburg, Mr.
12 Kaplan is not here, and I think if that is the
13 hypothesis you are posing, I think you should permit the
14 witness to say that that in fact was the question that
15 was posed to him previously.
16 MR. BRANDENBURG: My questions don't posit any
17 particular relationship to Mr. Kaplan's questions. I am
18 just mentioning those to identify for the witness
19 similar subject matter.
20 JUDGE CARTER: Well, there's an implication
21 that he gave an answer on certain questions, and I
22 asked --
23 MR. BRANDENBURG: I can ask it with avoiding
24 any reference to Mr. Kaplan's question or answer if
25 you'd like, Mr. Chairman.

1 BY MR. BRANDENBURG: (Resuming)

2 Q Generally speaking, Dr. Beyea, if the changes
3 in wind direction were substantial, would not the
4 concentrations be lessened versus a situation were the
5 plume moved in a rather straight direction from the
6 point of release toward New York City?

7 A (WITNESS BEYEA) It would depend on the total
8 path length followed by the plume. If the total path
9 length is much longer than 35 miles, then the
10 concentrations in the plume would be decreased.

11 Q Dr. Beyea, in connection with this testimony
12 or on any other occasion, have you ever performed any
13 wind trajectory analyses on meteorological data
14 collected at Indian Point?

15 A (WITNESS BEYEA) Of course, I looked to see
16 whether that was in fact important for my calculations,
17 and at this site in particular it is not. The wind
18 persistence at this site is very strong. Winds tend to
19 blow in one direction for a long time. In particular,
20 the PSAR says the probability of getting a 45 percent or
21 more change in wind direction within 45 miles is 28
22 percent.

23 JUDGE CARTER: Mr. Brandenburg, would you
24 repeat your question, and listen to the question
25 carefully and answer it.

1 MR. BRANDENBURG: (My question, Dr. Beyea --
2 and I might move to strike that answer. As fascinating
3 as it might have been, I don't believe it was responsive
4 to the question asked, Mr. Chairman, which I think was
5 the portent of your remarks.
6 Can we strike that answer and begin again?
7 JUDGE CARTER: Yes.
8 BY MR. BRANDENBURG: (Resuming)
9 Q Dr. Beyea, have you ever had a connection
10 either in preparing this testimony or on any other
11 occasion, performed wind trajectory analyses employing
12 meteorological data collected at Indian Point?
13 A (WITNESS BEYEA) Yes, I have.
14 Q Can you describe for us those occasions?
15 A (WITNESS BEYEA) In preparation for this
16 testimony, in preparation for other reports I have done
17 on the Indian Point site, I have looked at the
18 persistence of wind at this site to estimate the number
19 of occurrences in which wind trajectory changes would be
20 important. I then made an estimate of the total path
21 length that would be involved to reach New York City,
22 and from that analysis I concluded that the effect of
23 wind trajectory was not large enough to require explicit
24 account in a computer model.
25 Q Dr. Beyea, would you describe for us briefly

1 the difference between the principle of persistence to
2 which you referred and wind trajectory?
3 A (WITNESS BEYEA) Wind persistence gives you
4 information about the distribution of times that the
5 wind is blowing in a constant direction, and so that if
6 at a site there is a high persistence, then it is most
7 likely that the wind will be blowing in one direction
8 for a long time.
9 As I recall, the mean time between wind
10 changes at Indian Point, especially under stability
11 classes of concern, is very long, many, many hours.
12 JUDGE SHON: Dr. Beyea, if you'll excuse me
13 for a moment, Mr. Brandengburg, I think one of the
14 difficulties you are having in communicating with Mr.
15 Brandenburg here is that you were discussing strictly
16 time dependance of wind direction at a particular
17 point. It is not immediately clear that the dependence
18 of wind direction on position is also small if the time
19 dependence is small. In other words, it might blow in
20 this direction and be deflected by a mountain right over
21 there. Do you see what I mean?
22 Could you explain, then, why you assumed the
23 wind trajectory is in effect a straight line, simply
24 knowing that the wind doesn't change much in direction
25 at a particular point.

1 WITNESS BEYEA: Thank you.

2 I am assuming, then, that the frequency

3 distribution of wind direction at the site is

4 characteristic of the region and therefore, as you point

5 out, I am implicitly assuming that the same conditions

6 hold in the downwind direction from the Indian Point

7 site, and therefore I can use that data 10, 20, 30 miles

8 from the actual site.

9 JUDGE SHON: Is this usually for such a

10 topographically hilly place such as the Hudson Valley

11 and its surroundings?

12 WITNESS BEYEA: That is correct according to

13 the PSAR and according to the proximity to the ocean and

14 on-shore/off-shore breezes have an effect, as well as

15 the topology.

16 JUDGE SHON: Did that clear anything up, Mr.

17 Brandenburg, or make it more complicated?

18 MR. BRANDENBURG: I appreciate your efforts to

19 help clarify the situation, Judge Shon.

20 BY MR. BRANDENBURG: (Resuming)

21 Q Dr. Beyea, I believe you mentioned that you

22 had concluded that with respect to the Indian Point

23 site, because of its surrounding topographical

24 characteristics, you felt comfortable in employing

25 meteorological data generated at Indian Point to a

1 distance of I think you said 10, 20 to 30 miles from the
2 site, is that correct?
3 A (WITNESS BEYEA) That is correct.
4 Q In modeling the transport of the plume to the
5 New York City area such as is depicted on page 39 of
6 your testimony, did you in fact employ meteorological
7 data for distances beyond 30 miles from Indian Point?
8 A (WITNESS BEYEA) The drawing in figure 39 is
9 based on one constant set of meteorological data.
10 Meteorological parameters do not change in this
11 calculation with distance.
12 Q Dr. Beyea, are you familiar with the
13 meteorological principle of zone of influence?
14 A (WITNESS BEYEA) I think I would prefer if you
15 would define that for me.
16 Q Well, I'm asking if you are familiar with it
17 as a term of art, zone of influence as a meteorological
18 principle?
19 A (WITNESS BEYEA) I am sure I'm familiar with
20 the principle. I'm not familiar with the terminology
21 you are using to describe it.
22 Q Do you have any understanding of a generally
23 accepted meteorological rule of thumb as to the distance
24 away from any particular data collection point,
25 meteorological information can be applied under good

1 principles of meteorological practice?

2 A (WITNESS BEYEA) I have some understanding of

3 such factors.

4 Q What is your general understanding of the rule

5 of thumb employed as to how far away from any particular

6 collection point meteorological data can be applied with

7 some degree of confidence?

8 A (WITNESS BEYEA) It depends on how carefully

9 you correct for local features. For instance, although

10 the wind direction may change at different sites, there

11 tends to be an average difference between the average

12 wind direction at each site due to differences in ground

13 friction and so on.

14 So if you are careful, you can scale

15 information at one site, from one site to another, and

16 also the higher above ground that you go, the easier it

17 is to use information from one site to the other.

18 Q You said if you are careful you can use data

19 collected at one site at distances somewhat removed from

20 that site.

21 What "carefulness" would you wish to see in

22 making such effort.

23 I think you mentioned topographical features.

24 Are there others?

25 A (WITNESS BEYEA) Well, there is proximity to

1 the on-shore/off-shore breezes. There are obviously
2 questions of different topography channeling effects,
3 mountains, obstacles and so on.
4 Q Now, I'm speaking on a generic basis now, Dr.
5 Beyea. I am not referring to any particular site, but
6 are you familiar with a general rule of thumb in
7 meteorological practice of 10 miles as being the zone of
8 influence, that is to say, the distance from any one
9 particular data collection point, that meteorological
10 data can be applied with some degree of reliability and
11 certainty?
12 A (WITNESS BEYEA) I do not believe that is
13 correct. I think there are such -- it certainly is not
14 true at high altitudes. Perhaps you are referring to
15 ground level data.
16 JUDGE SHON: Dr. Beyea, are you familiar with
17 the notion of synoptic meteorological data?
18 WITNESS BEYEA: Right, large scale weather
19 changes.
20 JUDGE SHON: And how does that influence the
21 notion of how large an area you can apply measurements
22 made at a particular point?
23 WITNESS BEYEA: The large scale -- if you go
24 up high enough from the ground, then you do not expect
25 to have very much difference over distances of 30 or 40

1 miles. As you get close to the ground, then you can
2 indeed have differences in wind direction, average wind
3 direction, wind speed and the like.
4 JUDGE SHON: And I think you answered one of
5 my questions awhile ago by saying that in the region
6 around the Hudson Valley you didn't expect much change
7 of that sort, isn't that correct?
8 It sort of surprised me at the time.
9 WITNESS BEYEA: Well, now, we are talking abot
10 wind directions down the valley now. There, of course,
11 are differences if you are going to go east and west of
12 the site, and those differences show up very strongly at
13 low level data. But as you go to the higher tower data,
14 you find less and less differences between
15 meteorological stations at Buchanan and West Point and
16 at various other sites.
17 JUDGE SHON: Thank you.
18 BY MR. BRANDENBURG: (Resuming)
19 Q Dr. Beyea, what is your understanding of the
20 elevation at which the data employed in your modeling,
21 the data base employed in your modeling was collected?
22 A (WITNESS BEYEA) The data for the -- well, as
23 I said, we used different data for different parts of
24 this testimony.
25 Q I think you mentioned the benchmark data base

1 and others.

2 A (WITNESS BEYEA) The benchmark data base has

3 data at 25 meters and I guess 100 meters, maybe 125

4 meters and 25 meters. That is a standard NRC data base

5 that is used.

6 Q And I believe you mentioned another data base

7 other than the benchmark.

8 A (WITNESS BEYEA) The safety analysis report.

9 Q What is your understanding of the elevation at

10 which the meteorological data employed in that report

11 was collected?

12 A (WITNESS BEYEA) I believe they did both 25

13 and 125 meter data.

14 Q Would you characterize those as essentially

15 ground data conditions, Dr. Beyea?

16 A (WITNESS BEYEA) Well, for certain wind

17 directions, yes, and for other wind directions I would

18 say the 125 meter data is characteristic of an elevated

19 release.

20 Q Dr. Beyea, I believe you testified yesterday

21 that you had some general familiarity with the

22 methodology employed in Indian Point probabilitic safety

23 study, and my question to you is are you aware of the

24 meteorological data that was employed in that study?

25 A (WITNESS BEYEA) I am not aware of which data

1 base was used.

2 Q Assuming there was just one.

3 Dr. Beyea, a few moments ago we were

4 discussing the principle of persistence, and I think you

5 attempted to describe that for us.

6 Can you tell us whether or not the principle

7 of assistance was accommodated in your modeling for

8 purposes of Tables 3, 4, and 5 in your prefiled

9 testimony?

10 A (WITNESS BEYEA) It is implicitly in there

11 because the persistence data at Indian Point, which is

12 given in certain PSARs, indicates that the wind tends to

13 blow in one direction. Those tables take that for

14 granted.

15 Q In either of the two data bases which you

16 indicated you employed in modeling your results for this

17 testimony, Dr. Beyea, are you familiar with the

18 frequency of occurrence of winds from this 45 degree

19 northerly and north northwesterly sector for periods of

20 at least four hours?

21 A (WITNESS BEYEA) From what I read in the PSAR,

22 yes.

23 Q Can you give us some feeling -- I think we had

24 agreement a moment ago that Pasquill D stability class

25 in, 8 to 12 mile per hour speed class in northerly

1 directions occurred approximately 2 percent of the
2 time.
3 Do you have any number that you could share
4 with us as to the frequency of northerly or north
5 northwesterly winds prevailing for a period of at least
6 4 hours within the period of data which you used in
7 preparing your testimony here?
8 A (WITNESS BEYEA) I do not have such data
9 here.
10 Q Dr. Beyea, you indicated a few moments ago in
11 response to a question which Judge Shon addressed to you
12 that it was your general understanding that there was a
13 high level of persistence of northerly winds in the
14 vicinity of Indian Point, that is to say, if the wind is
15 blowing from a northerly direction at one point in time,
16 it can be relied upon to continue blowing from that
17 direction for some extended period.
18 Can you tell us on what you rely, on what
19 information you rely specifically to arrive at the
20 conclusion of the persistence of northerly winds in the
21 vicinity of Indian Point?
22 A (WITNESS BEYEA) I relied on data that was
23 given in one of the two safety analysis reports that I
24 read, either the 1968 or the 1973 version.
25 Q Could you direct us to certain tables --

1 hopefully this won't bog us down too long -- could you
2 possibly direct us to certain tables or chapters or
3 something like that more specifically in these two data
4 bases?
5 A (WITNESS BEYEA) Although I have four boxes of
6 documents behind me, I do not have copies of Chapter 2
7 of the various PSARs. I might add that -- well, at some
8 point I would like to make a comment about modeling
9 relevant to these comments. I don't know whether this
10 is the appropriate time.
11 Q Well, perhaps Mr. Blum can direct you in that
12 vein when we get to the redirect stage.
13 Dr. Beyea, I was interested in the four boxes
14 you just referred to. They are behind you. I recall
15 that yesterday on a couple of occasions you did refer to
16 them.
17 Were those documents you employed in preparing
18 your testimony for this proceeding?
19 A (WITNESS BEYEA) Some are documents that were
20 prepared for this proceeding. Some are documents that I
21 thought might come up and that you might refer me to.
22 Q Now, to the extent that some of those
23 documents are documents which you relied upon or
24 employed in connection with this proceeding, have you
25 had any discussions with counsel as to whether or not

1 those documents should have or may have been exhibited
2 and produced to the Licensee for inspection?
3 A (WITNESS BEYEA) Virtually every document that
4 we used, in fact, every document that we used at the
5 time interrogatories were filed were made available to
6 the Licensees where they were not easily found in the
7 literature. There may have been some documents that we
8 consulted, that were filed after the interrogatories
9 were answered. But those I think are all documents in
10 the general literature.
11 MR. BRANDENBURG: We are venturing into
12 lawyers' area, Dr. Beyea, I realize, but Mr. Blum is
13 present, and it is our understanding that our
14 information requests, interrogatories and so on, which
15 do call for documents extend forward in time and ask for
16 documents upon which you relied up to and including the
17 time of your giving your testimony here today. So for
18 Mr. Blum's benefit, if there are documents which we have
19 not been apprised of at the time of the filing of
20 interrogatory responses but which, nonetheless, were
21 employed in connection with Dr. Beyea's testifying here
22 today, we would like to have those identified for us,
23 and I would like to include within that request
24 documents which are in the public domain, public
25 document room and so forth.

1 MR. COLARULLI: The Power Authority would join
2 in that request.
3 MR. BIALIK: Mr. Chairman, this isn't a
4 deposition. The Licensees had two depositions of Dr.
5 Beyea, and certainly the second one which came after the
6 testimony would have been the appropriate time to mark
7 each and every exhibit. He now has the records with him
8 and he can answer substantive questions, but this is not
9 the time for the Board or anybody here to go through the
10 four boxes just to mark exhibits.
11 MR. BRANDENBURG: I don't propose to at this
12 time, Mr. Chairman. I think perhaps inadvertently we
13 may have stumbled upon some hopefully slight shortfall
14 in the sponsoring Intervenor's compliance with discovery
15 requests. I do not propose to interrupt the course of
16 this examination for any period of time. I would be
17 very happy, though, if Mr. Blum could give us a list of
18 any documents which have not previously been provided to
19 us which Dr. Beyea employed in connection with his
20 appearance here before.
21 MR. BLUM: Your Honor, I would object to the
22 insinuation of a shortfall. At the time of the last
23 deposition, the Licensees had Dr. Beyea's testimony.
24 They were given every document they requested. There
25 were certain things that were publicly available in the

1 literature, and they were given complete citations for
2 those.
3 Now, if Dr. Beyea is asked wide ranging
4 questions and wishes to rely on additional documents of
5 which he has knowledge, that cannot be considered a
6 shortfall in the discovery request.
7 MR. COLARULLI: Mr. Chairman, if I may?
8 MR. BRANDENBURG: I am somewhat overwhelmed by
9 these four boxes, Mr. Chairman, we can all see before
10 us. I don't recall anything approximating that in terms
11 of the volume of material identified previously by Mr.
12 Blum. If Mr. Blum can give us assurances that all of
13 the material upon which Dr. Beyea has relied has either
14 been produced for our inspection or identified for us,
15 then my requests have been fully met and we needn't
16 proceed further on this point.
17 But all I am asking is that to the extent that
18 material was relied upon by Mr. Palenik and Dr. Beyea in
19 connection with their appearances here today that has
20 not previously been identified for us, we would like
21 that identified at Mr. Blum's earliest convenience.
22 WITNESS BEYEA: There is only one such
23 document I can think of and that was something I
24 couldn't find at the time of the interrogatories. It
25 was brought up in depositions, I believe, and two or

1 three days ago we found the benchmark compilation of the
2 stability classes, and we would be glad to make that
3 available to the various parties in these proceedings.
4 I would also add that most of the documents in
5 the boxes are copies of the documents that appear in the
6 footnotes to our testimony, and there are additional
7 copies of the documents that appear on my resume. That
8 is most of the -- and the material that was requested in
9 interrogatories.
10 MR. BRANDENBURG: I think this problem has
11 diffused itself, Mr. Chairman, although I remain
12 somewhat mystified by the volume of material contained
13 in the four boxes.
14 I propose to move on.
15 JUDGE CARTER: I hope Mr. Blum doesn't ask you
16 about your witnesses' boxes.
17 Continue with your cross examination.
18 BY MR. BRANDENBURG: (Resuming)
19 Q I think we were at the point when we were
20 asking Mr. Palenik and Dr. Beyea to try and give us a
21 little more specific focus on the information they
22 relied upon in concluding that there was a high
23 persistence in northerly and north northwesterly winds.
24 A (WITNESS BEYEA) As I repeat, the information
25 was taken from the discussions of the meteorological

1 conditions at the Indian Point site which were discussed
2 in the safety analysis reports at Indian Point.
3 Q So do I understand that your conclusions and
4 opinions on persistence are entirely dependent upon your
5 review of those two data bases?
6 A (WITNESS BEYEA) It is my recollection, and I
7 believe it is from the SARs. I know it is from our
8 Nuclear Regulatory Commission document. There is a
9 table of wind persistence at Indian Point. I have seen
10 such a table. And I believe it is in the SARs, in
11 either the preliminary or the final. I have looked at
12 many, many documents over the course of the last five
13 years referring to the Indian Point site.
14 Q Dr. Beyea, in modeling the consequences
15 referred to in your testimony in this proceeding, I
16 believe you assumed that the plume release would occur
17 over a period of one half hour, is that correct?
18 A (WITNESS BEYEA) That is correct.
19 Q What was your basis for selecting the one half
20 hour period of time for othe plume release?
21 A (WITNESS BEYEA) That was the number that was
22 used in the reactor safety study for a PWR 2 release.
23 Q Now, did you consider any features specific to
24 either the Indian Point units which might either prolong
25 or shorten this release period under the postulated PWR

1 2 release?

2 A (WITNESS BEYEA) From my understanding, the

3 release time of a large release is a very uncertain

4 parameter, that you have to pick a number, and the

5 reactor safety study picked a half an hour, and that was

6 the number that we used.

7 We did look at see what number was chosen in

8 the Indian Point probabilistic risk assessment for a

9 similar release.

10 Q And what is your understanding of that period,

11 of that duration?

12 A (WITNESS BEYEA) I believe in that document

13 they chose one hour.

14 Q Now, my question relates specifically to

15 whether or not in modeling your results in your

16 testimony here, whether you considered any plant

17 features which are peculiar to the Indian Point units

18 which might either prolong or shorten the release.

19 A (WITNESS BEYEA) Only to the extent that I

20 read through the various discussions or core readings,

21 core melts at Indian Point and found no indication that

22 there would be any difference for a release in which

23 there was serious overheating and a large pathway into

24 the atmosphere, a direct pathway into the atmosphere.

25 Q So you are unaware of any specific plant

1 features that would likely affect the duration of the
2 release?
3 A (WITNESS BEYEA) That is correct.
4 Q Now, what is the similar release, I believe is
5 the term that you used, in the Indian Point
6 probabilistic safety study for which you testified, I
7 believe, the period of release employed was one hour?
8 A (WITNESS BEYEA) This is information from
9 Table 6.2-16 of Volume 5 of the Indian Point
10 probabilistic safety study, and under the designation 2
11 and Z-1, duration of the release is given as one hour.
12 There is another release Z-1Q, which is given as 0.5,
13 but it is our understanding that a release similar to a
14 PWR 2 was that called release 2 and Z-1.
15 Q On a generic basis, Dr. Beyea, now moving away
16 from the Indian Point probabilistic safety study for a
17 moment, but on a generic basis, if all else was equal,
18 would the plume concentrations of radionuclides be
19 diluted or concentrated if the release were postulated
20 to occur over a period longer than one half hour?
21 A (WITNESS BEYEA) The release relations to --
22 I'm sorry, the concentrations would be slightly lower by
23 a longer release time. I point out again that the total
24 population dose and long term health effects would be
25 only very slightly affected.

1 Q I think you just stated that the
2 concentrations would be slightly reduced.
3 A (WITNESS BEYEA) That is correct.
4 Q What are the phenomena that would cause this
5 reduction to merely be slight? Let us just pick two
6 specific time periods for a frame of reference. Let's
7 say we have on the one hand a one half hour release
8 period and on the other hand we would postulate a one
9 hour release period.
10 .Why would the concentrations of radionuclides
11 in the plume material be only slightly reduced in the
12 latter circumstance?
13 What are the phenomena that would cause that
14 to occur, in your opinion?
15 A (WITNESS BEYEA) It has to do with greater
16 wind meander during the period. That has been well
17 studied, and there are various mathematical formulations
18 which relate the dispersion coefficients that should be
19 used for different times. In the reactor safety study,
20 the formulation that was used there, one would get a 25
21 percent increase in the horizontal dispersion
22 coefficient by increasing the release to one hour, from
23 .5 to one hour. In the reactor safety study it is
24 pointed out that there is uncertainty in that formula.
25 It may be less, it may be more.

1 Q Do I understand your answer to be that wind
2 meander is the reason that the concentration of nuclides
3 in the plume would only be slightly reduced from a one
4 half hour to a one hour release?
5 A (WITNESS BEYEA) Well, I want to be careful
6 about using the word meander in a technical sense. That
7 is not the technical description but I think it is a
8 fair general description of the effect, that there would
9 be more chance for minor wind fluctuations to spread the
10 plume out somewhat.
11 Q We have a given quantum of fission products,
12 do we not, being exhausted from the plant in the
13 postulated PWR 2 release, and what I am attempting to
14 pursue, Dr. Beyea, is the concentrations of that
15 material in the plume if the conditions are such that
16 the release occurs in a one half hour period versus a
17 one hour period.
18 A (WITNESS BEYEA) I see the problem. I see the
19 confusion. I have been thinking of integrated exposure
20 and you are thinking of instantaneous exposure. You are
21 looking at concentrations in the plume, and I am looking
22 at concentrations in terms of time in the plume. I
23 think that is the problem.
24 JUDGE SHON: I think, Dr. Beyea, the problem
25 is this, that Mr. Brandenburg has been driving directly

1 at the individual concentration in the plume, and when
2 the plume is longer these drop down. But the individual
3 point at which the dose must be integrated stays in that
4 plume longer through time.
5 WITNESS BEYEA: I'm sorry. I just missed. I
6 assumed he was talking about integrated exposure,
7 integrated concentration. I apologize. I missed the
8 whole point. So we have to backtrack then.
9 The instantaneous concentration also drops
10 with the length of time of the release.
11 JUDGE SHON: And the instantaneous
12 concentration for a one hour release versus a half hour
13 release would go down approximately a factor of two,
14 wouldn't it?
15 WITNESS BEYEA: That is correct, and then
16 there is the other effect I mentioned.
17 JUDGE SHON: And the exposure time for any
18 individual in the plume would go up by a factor of two,
19 and they approximately balance if you don't account for
20 decay in the plume or minor variations in second order
21 effects.
22 WITNESS BEYEA: That is also correct. There
23 also is this other effect I mentioned, which is that
24 there is a slight change in the horizontal dispersion
25 coefficient, but that is a small effect.

1 JUDGE SHON: I think you are both speaking the
2 same language now.
3 MR. BRANDENBURG: I think, Dr. Shon, the
4 receptor under your postulated theory would have to
5 remain in one place, and the factor of a person being in
6 transit would be as well.
7 JUDGE SHON: That's true, but it isn't always
8 necessarily a human being. It could be the ground
9 deposition.
10 I think Dr. Beyea testified a fair fraction is
11 because of the deposed radionuclides, and ground doesn't
12 move much, at least not under anything outside of an
13 earthquake.
14 BY MR. BRANDENBURG: (Resuming)
15 Q Dr. Beyea, I believe you testified yesterday
16 that under the postulated PWR 2 release which you
17 modeled in your testimony, 7 percent of the radioative
18 iodine would be discharge in the event of a serious
19 accident, is that right?
20 A (WITNESS BEYEA) 70 percent.
21 Q 70 percent, yes.
22 May I direct your attention to page 27 of your
23 prefiled testimony, and the quoted material at lines 13
24 through 15?
25 A (WITNESS BEYEA) Would you give us the page

1 reference?

2 Q Page 27.

3 A (WITNESS BEYEA) Which lines?

4 Q In the quoted lines 13 through 15, in the

5 quoted material, in this report what you referenced was

6 10 to 50 percent of the core inventory of radioiodine

7 released?

8 A (WITNESS BEYEA) Yes.

9 Q. You, as I understand it, used standard

10 principles of gaussian diffusion in connection with the

11 modeling in your testimony, is that correct?

12 A (WITNESS BEYEA) That is correct.

13 Q What is your understanding, generally

14 speaking, of the effects of wind meander upon the rate

15 at which diffusion occurs?

16 A (WITNESS BEYEA) To a certain extent that is

17 already included in the dispersion coefficients, and the

18 dispersion coefficients take that into account for small

19 meanders.

20 Q All else being equal, wind speed, stability

21 class, etc., if on the one hand we have wind steadily

22 coming from the north, let's say, and on the other hand

23 we have wind predominantly coming from the north but

24 meandering from side to side, north to northwest, north

25 northeast and so forth, would in the latter situation,

1 would the rate of diffusion of the material be increased
2 or decreased?
3 A (WITNESS BEYEA) Since the average path length
4 is greater, the dispersion would be increased the same
5 distance from the plant.
6 Q How applicable is the standard gaussian
7 diffusion model which you employed in your testimony to
8 diffusion occurring in mountainous terrain, in your
9 opinion?
10 A (WITNESS BEYEA) It can be very inappropriate
11 for low level releases.
12 Q Dr. Beyea, did you incorporated in the
13 modeling and your testimony here any topographic effects
14 which you observed in observing the Indian Point units?
15 A (WITNESS BEYEA) Yes, we did.
16 Q Would you describe them for us and how you
17 employed them in your model?
18 A (WITNESS BEYEA) We used a modification to the
19 gaussian plume formation that is described in one of our
20 references, and there the approximation which is used is
21 to vary the height of the plume with the terrain
22 according to a formula. In other words, instead of
23 having the terrain fluctuate up and down, the model is
24 that you have a flat plain but you let the plume go up
25 and down, not exactly to follow the terrain, but

1 partially following the terrain.

2 JUDGE SHON: Which reference is that?

3 WITNESS BEYEA: It is the American

4 Meteorological Society reference.

5 BY MR. BRANDENBURG: (Resuming)

6 Q Dr. Beyea, let me --

7 JUDGE CARTER: Excuse me. Let the witness

8 answer Dr. Shon's question.

9 WITNESS BEYEA: It is our reference 21.

10 JUDGE CARTER: Do you have a page?

11 WITNESS BEYEA: The footnote is referenced on

12 page 4.

13 I would also like to point out that we did not

14 use that calculation in any critical sense. We simply

15 pointed out that for releases toward elevated parts of

16 the terrain around Indian Point, the doses would be

17 increased because in effect the plume distance between

18 the main part of the plume and the exposed person would

19 be decreased. Therefore I increased the dose. We

20 considered that to lead to mathematically and

21 effectively lower release height for elevated terrains.

22 JUDGE SHON: But you took the New York City

23 direction as being essentially on a plain,is that

24 correct?

25 WITNESS BEYEA: That's right. We looked at

1 the topographical maps, the height, and it looked to us
2 as though you would move down down the river, and
3 unlikely to be too much interference from the New York
4 side unless you were actually crossing that part of the
5 terrain, and from our mapping the size of the plume and
6 looking at the terrain, we did not think it would make
7 much difference.
8 There was some possibility of slightly
9 increased doses in Yonkers, but when we put in the
10 mathematics, it really didn't make that much
11 difference.
12 JUDGE SHON: Thank you. That is quite clear.
13 BY MR. BRANDENBURG: (Resuming)
14 Q Dr. Beyea, you just mentioned, I believe,
15 lower effective plume height or words to that effect in
16 response to Judge Shon's question.
17 Could you explain to us the significance of
18 the postulated plume rise to the dosage calculations
19 which you modeled in your testimony?
20 A (WITNESS BEYEA) The best analogy I can give
21 is a waterfall effect. When the plume rises to the
22 thermal buoyancy, it is as if a waterfall is occurring
23 where water comes out and falls down. If you are
24 underneath the waterfall you can get less water on your
25 head than if you are further out, right where the water

1 is falling, so that for residents close to the plant,
2 the initial rise of the plume tends to dominate the dose
3 calculations. For a relatively low plume rise,
4 residents close to the plant can be caught in a large
5 part of the plume which is high concentration. For a
6 plume that rises relatively high, residents close to the
7 plant can actually get loser doses than people further
8 downwind.
9 Q Roughly speaking, Dr. Beyea, I think you used
10 the terms low and high plume rise.
11 In meters or feet or what have you -- and
12 again I'm speaking only very roughly -- could you give
13 us some feel for what you would consider toi be a low
14 plume rise versus a high plume rise?
15 A (WITNESS BEYEA) Well, the actual plume rise
16 depends upon the stability conditions and the wind
17 speed, but if I could give you some examples, that might
18 help.
19 The plume rise also depends on the thermal
20 release rate, the amount of energy that is being
21 released into steam.
22 Q Maybe it would be useful --
23 A (WITNESS BEYEA) I think that an illustration
24 of D stability class, a relatively high plume rise would
25 be -- well, a mid-range plume rise would be 150 meters.

1 A low plume rise would be 75 meters. And a very high
2 plume rise would be 450 meters.
3 Q Is this from the point of release, Dr. Beyea,
4 or from the ground?
5 A (WITNESS BEYEA) This would be from the
6 ground.
7 Q Maybe it would be useful for all of us if we
8 referred to the figure appearing on page 15 of your
9 testimony.
10 What we are discussing, are we not, Dr. Beyea,
11 is the distance at which the plume rises roughly in a
12 vertical direction before it bends over in response to
13 wind conditions.
14 A (WITNESS BEYEA) That is correct.
15 Q I believe you had that point on your diagram
16 here on page 15, appearing as "effective release
17 height,"is that correct?
18 A (WITNESS BEYEA) That is correct.
19 Q You mentioned thermal buoyancy as a factor in
20 effective release height. What is the significance of
21 the temperature of the plume materials to the effective
22 release height that will occur?
23 A (WITNESS BEYEA) Well, it changes the density
24 of the air, or the material, and therefore it changes
25 the thermal lift.

1 Q Do you consider the temperature of the plume
2 material to be a substantial consideration in
3 determining the effective release height?
4 A (WITNESS BEYEA) That is only one of many
5 parameters which come into the calculation of the
6 release height.
7 Q And do you consider that to be a substantial
8 one?
9 A (WITNESS BEYEA) No, I do not. The main,
10 dominant effect is not the temperature but the average
11 rate of power released into the plume.
12 Q Now, in modeling the results employed in your
13 testimony here, did you assume a constant wind speed and
14 direction during the period of plume rise, that is to
15 say, from the point of release here in the figure on
16 page 15, up to and including the point which you
17 identified as effective release height?
18 A (WITNESS BEYEA) Yes, I did.
19 Q Would changes in wind speed or direction
20 occurring during this plume rise act to accelerate the
21 diffusion of the plume materials?
22 A (WITNESS BEYEA) Yes, it would.
23 Q I believe earlier you mentioned as a
24 substantial factor in determining the amount of plume
25 rise the average rate of power being released. Is that

1 correct? Did I quote you correctly?

2 A (WITNESS BEYEA) I consider that the dominant

3 factor that determines the plume rise in theoretical

4 formulas, yes.

5 Q Would you describe to us what phenomena are at

6 work here?

7 A (WITNESS BEYEA) Well, you have to --

8 physically you can imagine that you have a region, a

9 closed volume of a gas of a certain density. The

10 difference in density between that air and the

11 surrounding air gives you the net lift on that

12 material. So what you have to do is you have to

13 calculate the temperature, and then you have to

14 calculate the size of the plume -- in other words, the

15 size of the plume also depends on the temperature. Then

16 you have to do a mathematical integration over that area

17 and calculate the net lift, and then you have to balance

18 that against the friction to come up with a net rise,

19 and perhaps even more important, you have to decide

20 whether you can even use a formulation like that. The

21 standard formulas assume there is no turbulence, and

22 recent indications are that in fact for power factors

23 which are reasonable for reactor accidents, you may not

24 even get lift-off, you may not even get that formulation

25 that I spoke of before.

1 Q You used the term average rate of power, I
2 think, in your answer to the previous question.
3 How would you express that for us? What
4 yardsticks of quantification would you employ?
5 A (WITNESS BEYEA) Megawatts, calories per
6 hour.
7 JUDGE SHON: Excuse me. Dr. Beyea. I am not
8 quite sure I understand where this power is coming
9 from.. It is megawatts or Btus per hour or something?
10 WITNESS BEYEA: Yes. It is coming from the
11 energy in the core. In other words, the core is now
12 pouring energy out into the atmosphere.
13 JUDGE SHON: Presumably that has more or less
14 happened. You have a warm atmosphere that is exhibiting
15 a heat vaporization that was in the core, and there is
16 an awful lot of it.
17 WITNESS BEYEA: So in the material that is
18 rising, there is a certain amount of energy, and the key
19 dominant parameter for most stability classes -- there
20 are other factors that come in, at least the start of
21 the problem.
22 JUDGE SHON: That will be per hour that this
23 material is released past Indian Point? I mean, an
24 awful lot of the energy that came out of the core may
25 have come out before the leak occurs.

1 WITNESS BEYEA: It is the sensible heat that
2 we are talking about.
3 JUDGE SHON: That is the point. The sensible
4 heat is not really perceivable as power. It doesn't
5 have the time unit in it.
6 WITNESS BEYEA: That is passing per unit of
7 time out of the reactor.
8 Let me think about it. No, you are right.
9 There is an additional effect on the plume rise based on
10 condensation or evaporation. You can actually have the
11 plume go up and down.
12 JUDGE SHON: Well, it's a very complex thing.
13 I mean, there are some dry lapse rate that the thing
14 would move up with if it didn't have any moisture in it,
15 and if it's got some driving force from pressure and
16 it's spurting out, it might go higher. There is an
17 awfully complex --
18 WITNESS BEYEA: And downwind where the
19 material might condense, you've got condensation back
20 again, the plume might actually dip.
21 JUDGE SHON: I suppose it could under certain
22 circumstance. It seems like a very complex thing that
23 wouldn't be defined by a single parameter like power.
24 WITNESS BEYEA: Well, that is true, but as in
25 many complex calculations, there sometimes is a dominant

1 factor that comes out, and again, this is all second
2 hand since I am following formulations and discussions
3 that Briggs has made. But under certain conditions, the
4 key factor is -- well as you say, there are many other
5 factors.
6 JUDGE SHON: It wouldn't be the instantaneous
7 power being generated in the core molten mass at the
8 tie, would it? It doesn't seem that it would be because
9 it would depend upon a previous history of power.
10 WITNESS BEYEA: No, but it is really the
11 amount of power that is leaving or the amount of energy
12 per second that is leaving the reactor, I believe.
13 JUDGE SHON: Or leaving the containment.
14 WITNESS BEYEA: Leaving the containment. I
15 meant the containment.
16 JUDGE SHON: Okay, that makes real sense. The
17 amount of energy would carry out per second through
18 whatever there is in the containment. I think I
19 understand that better now. Thank you.
20 BY MR. BRANDENBURG: (Resuming)
21 Q Dr. Beyea, let me turn your attention, if I
22 might, to page 28 of your prefiled testimony.
23 In the errata sheet that was distributed to us
24 on Wednesday, you struck the sentence starting with the
25 words "The calculations" on line 13 of page 28.

1 Do you have that?

2 A (WITNESS BEYEA) That is correct.

3 Q Can you explain to us why that sentence was

4 deleted from your final testimony?

5 A (WITNESS BEYEA) When we initially prepared

6 this we were under the impression that our calculation

7 of this in the model was conservative. We had made a

8 very simple model, one that was easily traceable and

9 easily understandable in proceedings like this. The

10 next step, which we had not completed by the time of the

11 original filing, was to make a more refined calculation,

12 and we noted that there were other -- that there were

13 other approximations that we had made which were not

14 conservative, and so we felt it was incorrect to put a

15 statement there to imply that the overall calculation

16 was conservative since we had found other factors tended

17 to compensate.

18 We redid the calculations using not a wedge,

19 not a point wedge but using a more exact angle at each

20 distance, taking proper account, correcting certain

21 errors, the smaller errors that were involved, taking --

22 and then we came out with -- we did a calculation and

23 came out with essentially similar numbers, but I didn't

24 want to give the impression that -- I thought it gave

25 the wrong impression to mention one factor that was

1 conservative.

2 Q Dr. Beyea, is the -- in the modeling which you

3 performed for your testimony here, is it or is it not

4 true that the dose for an entire sector such as you used

5 it was assumed to be that at the end of the sector?

6 A (WITNESS BEYEA) That is correct, in this

7 calculation given in the testimony, yes.

8 Q Dr. Beyea, let's turn, if we may, to page 39

9 of your prefiled testimony.

10 Dr. Beyea, was this pictoral representation

11 appearing on page 39 if your testimony initially

12 prepared for some other purpose?

13 A (WITNESS BEYEA) Yes, it was.

14 Q Can you tell us what that was?

15 A (WITNESS BEYEA) It was prepared for some

16 testimony I gave in another proceeding on Indian Point.

17 Q Which proceeding?

18 A (WITNESS BEYEA) I will tell you which it is

19 in a second here. It is listed on my resume, and I

20 believe it is entitled "The Impact on New York City of

21 Reactor Accidents at Indian Point," dated June 11,

22 1979.

23 But let me just check to see if it does appear

24 in that reference.

25 JUDGE CARTER: Mr. Brandenburg, would you let

1 us know when it is a good time to take a break? We are
2 almost at the end of an hour and a half of you
3 examination.
4 MR. BRANDENBURG: I think we might come to a
5 stopping point in another five minutes or so.
6 WITNESS BEYEA: Yes, that was the proceeding
7 for which I prepared this graph.
8 BY MR. BRANDENBURG: (Resuming)
9 Q Now, unlike other modeling, such as occurs on
10 Table 3 on page 30, I had difficulty finding in this
11 testimony, Dr. Beyea, what assumptions you made in
12 connection with figure 5 appearing on page 39, with
13 respect to stability class, wind speed, shielding
14 factors, the release rates, wind direction, persistence,
15 etc.
16 Could you enlighten us as to what assumptions
17 were implicit in the modeling portrayed on Page 39?
18 A (WITNESS BEYEA) Yes. That would have been a
19 D stability class, 5 meteres per second wind speed,
20 ground shielding factor of .33. I believe the initial
21 release site was 100 meters, but I'm not sure of that
22 and it's not critical.
23 The -- as I mentioned yesterday, two-thirds of
24 the material was assumed to be removed within two year,
25 approximately two years.

1 Q Let's go back, if we may, to lines 13 through
2 16 on page 28 where we were a moment ago, and I
3 understood your answer to say, Dr. Beyea, that there
4 were some "minor calculational errors" which you
5 originally had prepared in something there.
6 Do I fairly characterize your earlier answer?
7 A (WITNESS BEYEA) That is correct.
8 Q Could you describe for us briefly what those
9 errors consisted of?
10 A (WITNESS BEYEA) We used a power for the
11 Indian Point reactor that was 90 percent too high. We
12 used an average dose that was 20 percent too high. In
13 certain cases we used a wedge angle -- well, all right,
14 those are the two. Those are the two minor errors, and
15 then there are other ways in which we were conservative,
16 and when you do the fuller calculation, it comes out to
17 give -- well, I might as well give the numbers.
18 JUDGE PARIS: It comes out to what?
19 WITNESS BEYEA: Well, I might as well give the
20 numbers.
21 BY MR. BRANDENBURG: (Resuming)
22 Q I didn't ask for any clarifications, Dr.
23 Beyea. I just asked for a description.
24 MR. BLUM: I think the witness should be
25 entitled to go forth and give his complete answer.

1 MR. BRANDENBURG: I am sure you can do that
2 when you time comes, Mr. Blum. That's not my question,
3 however.
4 MR. BLUM: It would be easier to follow if we
5 could do it all at once.
6 MR. LEVIN: Your Honor, Mr. Blum would like to
7 get something in evidence which is not in evidence. We
8 are simply trying to determine the characteristics of
9 the errors.
10 JUDGE CARTER: Could the witness finish his
11 answer?
12 WITNESS BEYEA: I was about to indicate the
13 net import of the more refined calculation.
14 JUDGE CARTER: That is something that Mr. Blum
15 can bring out.
16 All right, now, we have reached just about the
17 end of the allotted time, Mr. Brandenburg.
18 Can you conclude this examination when we
19 return in a brief period of time? Under the rules that
20 we set out you have about exhausted the time that you
21 had, but we are flexible.
22 MR. BRANDENBURG: I do have some more
23 material. It is not exceedingly long, however, Mr.
24 Chairman. I certainly think we can try and wrap this up
25 after we come back from the break, certainly before

1 lunch, I imagine.

2 JUDGE CARTER: Well, that is not in compliance

3 with the rules that we laid down. I think if you can

4 finish it up in about 15 minutes, that would not be

5 unreasonable.

6 I notice His Honor the Mayor of Buchanan is

7 here. Perhaps he can come forward during the break and

8 we'll see if we can accommodate him.

9 We will now take a recess of about 10

10 minutes.

11 (A brief recess was taken.)

12 JUDGE CARTER: Mr. Brandenburg, can you

13 continue and finish up your cross examination?

14 BY MR. BRANDENBURG: (Resuming)

15 Q Dr. Beyea, let us turn, if we may, to page

16 44(d) in your testimony. Now, in that and similar

17 figures contained in your testimony, various curves of

18 dosage expressed as a function of time are expressed, is

19 that correct?

20 A (WITNESS BEYEA) That is correct.

21 Q My question to you is would you tell us,

22 please, appearing on page 44(d), the values of the

23 parameters which change from curve to curve?

24 A (WITNESS BEYEA) I will do that.

25 This is on page 44(d)?

1 Q Yes.

2 The curve Rain Max, the max refers to the

3 chilling factor, and that is a minimum chilling factor,

4 I'm sorry, I'm sorry, a .3 ground chilling factor. So

5 the rain max case is simply a calculation with rain, but

6 with a chilling factor of .3 ground chilling factor,

7 whereas the Rain Minimum curve, which is the fourth

8 curve down, is the same calculation with a chilling

9 factor of 0.1.

10 JUDGE SHON: Dr. Geyea, wouldn't that give

11 them a factor of three? They don't seem to be a factor

12 of three apart, at least at 150 hours. They are more

13 than that.

14 WITNESS BEYEA: It would be approximately a

15 factor of three.

16 JUDGE SHON: I guess it is pretty close to a

17 factor of three.

18 WITNESS BEYEA: Approximately, yes.

19 We next go -- let's go to the simplest one,

20 single deposition max curve, which is the third curve

21 down. That is non-rain, and the deposition value of

22 0.1, and a shielding factor of 0.3.

23 We now go two more curves down to the curve

24 labeled "Single Deposition Min." That is for no rain,

25 deposition velocity of 0.1 and a shielding factor of

1 0.1.

2 Now, we come to the more difficult curve which

3 is the range maximum. That curve is calculated no rain,

4 shielding factor of 0.3, and the worst possible

5 deposition velocity ranging from a factor of 10 either

6 way, around .01.

7 The range minimum case is the same calculation

8 with the best possible deposition velocity in terms of

9 producing the lowest dose, and the best possible

10 shielding factor, i.e., 0.1, so that if we ignore the

11 rain max curve for a minimum, in a non-rain case, the

12 range maximum curve is the worst possible case, the

13 range min is the best possible case. And the single dep

14 min, single dep max tend to give you more of a mid-range

15 case.

16 BY MR. BRANDENBURG: (Resuming)

17 Q Dr. Beyea, are you familiar with the frequence

18 of occurrence of both rain and D stability class

19 conditions in the Indian Point vicinity?

20 A (WITNESS BEYEA) We are familiar with the

21 occurrence of rain under both D stability class and E

22 stability class at Indian Point.

23 Q And what is that frequency of occurrence from

24 the data base which you employed in connection with your

25 testimony?

1 A (WITNESS BEYEA) It would take us a few
2 minutes to sum up a bunch of numbers. Do you want us to
3 do that at the break or -- well, I guess there are no
4 more breaks after this.
5 Let me just take a minute here to look.
6 (Pause)
7 Q My problem comes in trying to employ both the
8 benchmark data and the other data base.
9 A (WITNESS BEYEA) The only data base we have on
10 rain in front of us is the benchmark data base. My
11 memory from the Indian Point PSIRs tells me it would be
12 about a 10 percent chance of rain occurring at that
13 site.
14 Q To try to move this along, Dr. Beyea, if you
15 have a page or a table from the benchmark data base that
16 you could refer us to for a determination of the both
17 rain and D stability conditions, I would be happy with
18 that.
19 A (WITNESS BEYEA) This is the document I
20 referred to before which I just found recently, and I
21 will make this available to you for copy.
22 JUDGE CARTER: Do you want that identified,
23 Mr. Brandenburgb?
24 MR. BRANDENBURG: It would be useful, Mr.
25 Chairman.

1 JUDGE CARTER: We'll have it identified.

2 If you want to have your people look at it and

3 decide when you want it identified, you can do that

4 before we close.

5 MR. BRANDENBURG: Let me move on for a

6 moment. I think that's an excellent suggestion, Mr.

7 Chairman.

8 BY MR. BRANDENBURG: (Resuming)

9 Q Dr. Beyea, let me direct your attention, if I

10 may, to page 38 of your prefiled testimony.

11 My question, Dr. Beyea, is has your

12 decontamination literature search extended beyond the

13 description of decontamination provided in WASH-1400?

14 A (WITNESS BEYEA) Yes, it has.

15 Q Could you describe the extent of that

16 literature search for us?

17 A (WITNESS BEYEA) I first began with the

18 references given in WASH-1400. I then searched the

19 Columbia University engineering library and the

20 Princeton University engineering library. I came up

21 with one book on the subject, I believe from Oak Ridge,

22 and a few documents, many documents about

23 decontamination of laboratories and so on, but only a

24 very small number of references on decontamination of

25 airborne radioactive materials outdoors. Most of that

1 literature referred to fallout where the particles are
2 some 100 times larger, and that is all that I found.
3 This, by the way, was about four years ago.
4 Q Is there some place or document in which the
5 literature that you relied on relating to the subject of
6 decontamination of built-up areas can be found because I
7 don't believe it is referred to in the references in
8 this present testimony.
9 A (WITNESS BEYEA) I do not have the reference
10 for that book, and I relied on that only to the
11 extent -- no, I didn't. Let's see.
12 (Pause)
13 A (WITNESS BEYEA) It is a reference I have
14 lost, and I would have to track it down. It is the
15 basis for part of my understanding that decontamination
16 is very, very difficult to do, more difficult than would
17 be expected.
18 JUDGE PARIS: So what you wrote here was
19 strictly from your memory of what you read in that book
20 and other documents four years ago.
21 WITNESS BEYEA: Including the reactor safety
22 study, including discussions with people who do these
23 consequence calculations, yes, that is correct.
24 BY MR. BRANDENBURG: (Resuming)
25 Q But all of this information is at least four

1 years old, if I understood your answer correctly.

2 A (WITNESS BEYEA) That is correct.

3 MR. BRANDENBURG: Mr. Chairman, I have had a

4 chance with some of my colleagues to look quickly at the

5 meteorological data which the witness was kind enough to

6 provide to us, and I would like to have this marked in

7 some fashion. I don't know if it's the witness' only

8 copy, however.

9 WITNESS BEYEA: It is my only copy.

10 MR. BRANDENBURG: Perhaps I could mark it as

11 CE-1, return it to the witness, ands he could provide us

12 copies at a later time.

13 JUDGE CARTER: Would you identify it, please.

14 MR. BRANDENBURG: This is a collection of

15 computer printout materials, Mr. Chairman, which bears

16 on its cover page the title "Joint Frequency Statistics

17 for Indian Point (10 Meters) 22 1/2 Degree Sectors," and

18 I have manually identified that document as CE-1.

19 JUDGE CARTER: It will be so marked.

20 (The document referred to

21 was marked Exhibit CE No.

22 1 for identification.)

23 JUDGE CARTER: Off the record.

24 (Discussion off the record.)

25 JUDGE CARTER: Back on the record.

1 BY MR. BRANDENBURG: (Resuming)

2 Q This document which we just identified as

3 CE-1, Dr. Beyea, would you try to explain to us a little

4 better, if you can, the origins of that data? Is that

5 data from any particular year or of any particular

6 study?

7 A (WITNESS BEYEA) That was sent to me from

8 Sandia Laboratories as it was sent to all participants

9 in the benchmark study. The site specific example that

10 was studied, that was used in the benchmark study was

11 picked to be Indian Point, and therefore the Indian

12 Point tapes were searched and that frequency

13 distribution was derived from that tape. I believe it

14 was Mr. David Aldridge who sent it to me or asked

15 someone else to send it to me.

16 Q Dr. Beyea, are you familiar with the manner in

17 which the NRC arrived at a distance of "about" ten miles

18 for the plume exposure emergency planning zone?

19 A (WITNESS BEYEA) I am familiar with the

20 supporting document, the joint NRC-EPA study, and I have

21 read certain discussions of how that ten miles was

22 arrived at.

23 Q Is the support document to which you referred

24 NUREG, N-U-R-E-G, 0396?

25 A (WITNESS BEYEA) I believe it is. Let me just

1 check it.

2 (Pause)

3 A (WITNESS BEYEA) Yes, it is.

4 Q And I believe you referred to additional

5 related support materials or literature.

6 Can you describe for us what those might be?

7 A (WITNESS BEYEA) There is an article in

8 Spectrum magazine, the journal of the IEEE, and I don't

9 know if we have a copy of that here. Let me just see if

10 we have a copy of it here.

11 Q My question specifically relates to the

12 supportive literature of materials you have reviewed and

13 relied upon.

14 A (WITNESS BEYEA) As I said, I have relied on

15 0396, interviews with interested parties, which is

16 contained in the Spectrum article, and discussions

17 with -- various informal discussions with NRC people and

18 others.

19 Q Any other written materials beyond the

20 NUREG0396 and the Spectrum articles?

21 A (WITNESS BEYEA) I may have read some

22 discussion in Nucleonics News or such things as that,

23 but I don't recall.

24 Q Dr. Beyea, what is your general understanding

25 of the principles employed by the NRC in selecting the

1 ten mile plume exposure EPZ?

2 A (WITNESS BEYFA) It is my understanding that

3 they looked at the frequency curves, probability

4 frequency curves from the reactor safety study, and

5 noted that the probability of early fatality dropped off

6 rather rapidly at ten miles. In other words, that there

7 was a break in the curve, not that there was not a

8 probability of early death beyond ten miles, but that

9 there was a sharp break, and that seems like a

10 reasonable point to set the ten mile EPZ.

11 JUDGE CARTER: Does that appear explicitly, or

12 is that your inference drawn from the material?

13 WITNESS BEYEA: I believe it is explicitly

14 stated in the Spectrum article as an interview, but I

15 will have to -- I do not think it -- it is certainly not

16 stated in any NRC documents, so it would either be

17 discussions and also it woud be in the Spectrum article,

18 and I will let you know if I have it here.

19 JUDGE PARIS: You say the spectrum article is

20 an interview?

21 WITNESS BEYEA: That is correct. It has

22 interviews with some of the participants in the

23 formulation of NUREG-0396.

24 JUDGE SHON: Isn't it a little surprising, Dr.

25 Beyea, that when all of the functions that seem to go

1 into determining this are rather well behaved, that
2 there should be any sort of a break, particularly with
3 the big uncertainties that exist in all of these
4 calculations, the meteorolcgy, the release, the
5 deposition velocities, the presence or absence of
6 people? It doesn't seem like the sort of thing that
7 would add up to a curve with a sharp break in it, does
8 it?
9 WITNESS BEYEA: I think the curve comes from
10 the weighting of the various accidents. I'm not exactly
11 sure about that, but I agree with you, the individual
12 probability curves for individual accidents show no
13 sharp breaks, but when you weight the various PWR
14 classes, I do believe that you get a sharp break at
15 around 10 miles.
16 JUDGE SHON: And it's due to the low
17 probability of accidents having inputs beyond a certain
18 distance.
19 WITNESS BEYEA: I believe that is true. It is
20 based on the assumption of the relative probabilities in
21 the reactor safety study.
22 JUDGE SHON: Thank you.
23 JUDGE CARTER: How significantly does the
24 probability change at 10 miles?
25 WITNESS BEYEA: It is certainly noticeable on

1 the curve.

2 Let me see if I can get 0396.

3 Apparently we do not have 0396 with us.

4 JUDGE PARIS: Let the record show the staff

5 handed the document 0396, is that right?

6 MS. MOORE: Yes.

7 WITNESS BEYEA: If you look at Figure I-11 on

8 page I-38, of that figure you see a rather sharp break

9 at about 11 miles, 10 miles, 11 miles in the 200 rem

10 curve, and I can pass it up.

11 JUDGE SHON: I can see it from here. The rim

12 covers the bottom curve?

13 WITNESS BEYEA: That is correct.

14 JUDGE SHON: That is about double the value

15 used for a threshold death curve, is that right?

16 WITNESS BEYEA: No. We use two thresholds,

17 one of 200 rem and one of 350 rem. The 350 rem results

18 were presented in the supplementary testimony we filed,

19 some of the questions that were not answered in the

20 original, but we used two thresholds because we couldn't

21 be sure which was correct, but the 200 rem threshold --

22 the only time we used 100 rem was in trying to estimate

23 how many people might need hospitalization.

24 JUDGE SHON: I see.

25 WITNESS BEYEA: But that was the only time we

1 used 100 rem.

2 JUDGE SHON: Thank you.

3 BY MR. BRANDENBURG: (Resuming)

4 Q Dr. Beyea, while we are on the subject of

5 dosages, let me direct your attention to page 18 of your

6 prefiled testimony, if I may.

7 Yesterday Mr. Colarulli inquired about the

8 numbers in the two columns portrayed in Table 1 on page

9 18 of your testimony, and I'd like to ask you a couple

10 of questions about the textual materials appearing

11 dsirectly below that.

12 A (WITNESS BEYEA) Yes.

13 Q Is this supportive treatment procedures

14 including reverse isolation and so on, the other ones

15 that you mention here on page 18, are those required for

16 persons receiving less than a 350 rem dose?

17 A (WITNESS BEYEA) Well, I am stumped by the

18 word "required."

19 Q Would they --

20 A (WITNESS BEYEA) They would be helpful for

21 doses below 350 rem. As I understand it, the problem of

22 the radiation dose is that it affects, depending on the

23 magnitude, it affects your immune system. I am not

24 talking now as an expert, I am talking about my

25 understanding of this. It affects your immune system,

1 and therefore you are more susceptible to disease, and
2 the idea of reverse isolation and sterilization is to
3 keep germs away from the patient.
4 Clearly you would like to deal with people
5 that have higher doses, but I do believe that if you do
6 not give these procedures to people with doses to 300
7 rem, you must shift over to the other curve, which is
8 the minimal treatment curve.
9 I do have the reference.
10 JUDGE CARTER: Mr. Brandenburg, can you bring
11 your examination to a close?
12 MR. BRANDENBURG: I'll try to do so. I do
13 have one or two more questions, Mr. Chairman.
14 BY MR. BRANDENBURG: (Resuming)
15 Q Dr. Beyea, is the minimal treatment column
16 contained on page 18 if your testimony in fact the
17 equivalent of the no treatment column and data employed
18 in the WASH-1400 study?
19 A (WITNESS BEYEA) I believe it is taken
20 directly from the reactor safety study, and I believe
21 they call it minimal treatment. Minimal treatment
22 consists of anything less than supportive treatment.
23 Q So is it your understanding that the
24 probability of early death referred to in Table 1, that
25 those probabilities would be as portrayed in the minimal

1 treatment column if persons received anything less than
2 the supportive treatment that is described in the
3 textual material?
4 A (WITNESS BEYEA) That is ma understanding.
5 Q Dr. Beyea, yesterday Mr. Colarulli ran you
6 through a number of plant systems, and I think I may
7 have added one or two myself, but I don't think we have
8 a wrap-up question in the record that I think might be
9 useful, and my question is, is it not true that in
10 modeling the accident consequences which you performed
11 in your testimony, that no features specific to the
12 Indian Point plants -- now, I'm not talking about the
13 site. I'm talking about the plants -- that no features
14 specific to the Indian Point plants were specific?
15 A (WITNESS BEYEA) I thought I answered this
16 question yesterday. What I did was to look through the
17 material describing Indian Point by the staff, by the
18 Sandia Laboratories, to see if there were anything in
19 those reports that suggested there were any features in
20 Indian Point that would change the assumptions that I
21 made, and I found no such discussion of any changes of
22 any features at Indian Point that would change the
23 release from a serious core overheating with direct path
24 out of containment.
25 Q Dr. Beyea, in response to the Chairman's

1 recommendation that I bring this to a close, I did have
2 one last question, and that is whether at any time in
3 the course of the preparation of your testimony for this
4 proceeding you had occasion to review either the
5 Commission's January 8, 1981 or September 18, 1981
6 orders setting this particular hearing in motion?
7 A (WITNESS BEYEA) I believe I did, but I
8 believe you'll have to give me a little more information
9 about the titles of those documents.
10 Q Let me be more specific.
11 On any occasion did you review Commission
12 Question 1 that is posed to all of us for this
13 proceeding?
14 A (WITNESS BEYEA) I am sure I did. I don't
15 remember what Question 1 is, but I know that I read it.
16 Q Let me read you a footnote to that question.
17 JUDGE CARTER: Why don't you read him the
18 question first and then read him the footnote.
19 MR. BRANDENBURG: Well, I'm going to ask when
20 I get through reading Footnote 5 to the Commission's
21 questions, Mr. Chairman, what the witness believes the
22 Commission intended by its use of the term "risk."
23 MR. BIALIK: Objection. This witness is not
24 an expert in deciding what the Commission meant by its
25 question.

1 MR. BLUM: This is a matter for legal
2 interpretation, and I don't see why he's asking the
3 witness this.
4 MR. BRANDENBURG: I am not asking for some
5 interpretation of the Commission's intention, Mr.
6 Chairman. I am going to ask --
7 JUDGE CARTER: It sounds like it. It is
8 pretty close.
9 MR. BRANDENBURG: Permit me to finish.
10 I'm going to ask the witness's -- if the
11 witness's employment of the term "risk" is the same as
12 he understood the Commission intended it to be.
13 JUDGE CARTER: I think if I might suggest you
14 ask him how he uses the word "risk" in the preparation
15 of his testimony. I wish we could all be sure we
16 understood precisely how any Court or Commission uses
17 certain words.
18 JUDGE PARIS: The record in this case makes it
19 abundantly clear that there can be more than one
20 interpretation to things at issue.
21 WITNESS BEYEA: Am I to answer my
22 understanding?
23 JUDGE CARTER: What do you understand by the
24 word "risk" in the context of this case?
25 WITNESS BEYEA: I think I would step back and

1 say you must start with what we call a risk spectrum,
2 that there is a frequency distribution for risks of
3 different magnitudes. Some people choose to take an
4 average of that curve or some other property of that
5 curve and call it risk. I tend to think that that
6 doesn't give you enough information and that you must
7 look at the risk spectrum, that what you really need is
8 some information about the relative probability of each
9 consequence event, and I do not think it is sufficient
10 to take the median value of that curve. Different
11 people have different ways of judging risk, and in my
12 experience, different people will judge different risk
13 curves, different risk spectrums in completely different
14 ways.
15 JUDGE CARTER: But you have used median values
16 in making other decision in giving your testimony.
17 WITNESS BEYEA: That is one piece of
18 information that is worth looking at, but I think you
19 have to look at the whole risk spectrum and make
20 judgments on that basis. It's not a scientific -- what
21 I would say is there is no scientific way that I know of
22 to come up with a foolproof single number to capture the
23 information in an entire risk spectrum.
24 JUDGE CARTER: You've told us what you do to
25 go find it, but you haven't told us what it is you're

1 looking for.

2 WITNESS BEYEA: Well, I would like to know,

3 for instance, what is the probability -- if I could get

4 such information, I would like to know what is the

5 probability at Indian Point of a PWR 2 release. I would

6 like to know that, and that would give me one piece of

7 information on the curve. I would like to know what the

8 probability of a much smaller release is. I would like

9 to know the probability of a very, very tiny release.

10 That would give me what I call the risk spectrum,

11 perhaps a listing of the probability of various kinds of

12 events that span the physically plausible range.

13 JUDGE CARTER: So you interpret risk as --

14 JUDGE PARIS: Maybe you should define risk.

15 JUDGE SHON: What I hear you saying, Dr.

16 Beyea, is risk is inherently a two dimensional or two

17 parameter matter. One of the parameters is consequences

18 measured by something like contamination or dose or

19 deaths or something. The other one is probability, that

20 one parameter represents probability, one represents

21 consequences, that risk is definable only as a two

22 dimensional manifold. It covers a range of both

23 variables.

24 WITNESS BEYEA: That's right.

25 JUDGE CARTER: Judge Shon, you can coach me

1 but don't coach the witness.

2 WITNESS BEYEA: He tried to translate what I

3 just tried to say.

4 Another way to look at it is I see risk as a

5 curve on a graph, as opposed to a single number.

6 JUDGE CARTER: Lawyers don't have that much

7 trouble.

8 Is there anything further?

9 JUDGE SHON: He didnt give me any trouble at

10 all.

11 MR. BRANDENBURG: Mr. Chairman, I have

12 struggled very hard to complete my cross examination

13 within the time period you had requested, and at this

14 time I am prepared to defer to the NRC Staff.

15 JUDGE CARTER: Mr. Hassle, are you ready to

16 proceed?

17 MR. HASSLE: Ms. Moore is going to conduct the

18 cross.

19 CROSS EXAMINATION

20 BY MS. MOORE:

21 Q Dr. Beyea, I'm going to ask you first for a

22 few definitions, just briefly, and that is on page 79 of

23 your testimony you state -- you assume along with

24 Parsons Brinkerhoff that the population requires 20

25 minutes to prepare, though you believe that this is a

1 conservative estimate.

2 Would you please define the term

3 "conservative" as used in that statement?

4 A (WITNESS BEYEA) I prefaced this by saying

5 this is a common sense statement. We believe that just

6 from a common sense feeling that it would take some

7 people more than 20 minutes to prepare for evacuation.

8 JUDGE SHON: I think, Dr. Beyea, what Ms.

9 Moore was trying to drive at was the use specifically of

10 the word "conservative." It is often a tricky and

11 ambiguous word.

12 WITNESS BEYEA: I agree with you. We should

13 have said: although we believe in some cases the time

14 could have been longer.

15 JUDGE SHON: I think that explains it.

16 MS. MOORE: Thank you.

17 BY MS. MOORE: (Resuming)

18 Q Would you please define the term "planned

19 evacuation" as used in Table 7A and 7B of your

20 testimony?

21 They are on page 44A and B, I believe.

22 A (WITNESS BEYEA) The term "planned evacuation"

23 refers to hypothetical evacuation plan that might be

24 established beyond ten miles. The ad hoc evacuation

25 term refers to the kind of actions that would be taken

1 on an ad hoc basis should it be recognized at the time
2 of an incident that there might need to be evacuation
3 beyond ten miles.
4 Q In other words, evacuation where a plan is not
5 necessarily in existence.
6 A (WITNESS BEYEA) Yes.
7 Q Or other kind of protective action. Is that
8 your definition if "ad hoc?" Is that what you are
9 saying?
10 A (WITNESS BEYEA) That is correct.
11 Q On page 26 of your testimony you state that
12 you did not examine the consequences of the more serious
13 PWR 1 release, and the reason you stated for that is
14 that most analysts have downgraded the possibility of
15 the initiating steam explosion scenario, but what I'm
16 interested in, Dr. Beyea, here is could you define for
17 me what you mean by the more serious PWR 1 release?
18 A (WITNESS BEYEA) As I stated yesterday, the
19 major difference between the two releases is the amount
20 of ruthenium that would be released. It is my
21 understanding that the ruthenium in a PWR 1 contributes
22 to the larger number of injuries assigned to PWR 1 in
23 the reactor safety study.
24 Q By injuries, could you tell me what you mean
25 by injuries in terms of the measures of consequences

1 used in that study?

2 A (WITNESS BEYEA) One would be death within one

3 year from doses on the order of 10,000 rads or more, and

4 the other would be lung cancer.

5 Q Is another term for the injury you describe

6 death in one year early fatalities?

7 A (WITNESS BEYEA) I am not sure because the way

8 we have defined early fatalities in our report is death

9 within 30 days, whereas in the reactor safety studies,

10 the deaths from ruthenium were within one year. So I

11 guess we need a new terminology for those kinds of

12 deaths, and I did not know whether the reactor safety

13 study lumped death from ruthenium in early deaths or

14 not. Of course, I think we could ask Dr. McGrath who is

15 sitting next to you what was done in that study.

16 Q It may be so, but he is not testifying today,

17 Dr. Beyea.

18 A (WITNESS BEYEA) I'm sorry. Let me correct.

19 I said early death was within 60 days in my testimony,

20 just to correct the record. That is what I should have

21 said.

22 Q Could you point to a calculation for us that

23 shows us the more serious nature of this PWR 1 release?

24 (Pause)

25 Q Dr. Beyea, if it would help --

1 A (WITNESS BEYEA) Well, I guess it would -- go
2 ahead. I'll keep looking.
3 Q What I was going to say was if it would be
4 helpful, we could come back after a break, if you could
5 give us that information then.
6 A (WITNESS BEYEA) I'll try to give you that
7 after the break.
8 Q Sometime during a break, if it would help, if
9 you would look at that time.
10 A (WITNESS BEYEA) That's fine.
11 Q In your testimony, Dr. Beyea, you discuss at
12 various pages different uncertainties. For example, you
13 talk about uncertainties in probability calculatins and
14 uncertainties in plume rise calculations, is that
15 correct?
16 A (WITNESS BEYEA) That is correct.
17 Q Isn't it correct also that there is another
18 uncertainty in consequence calculations, and that is the
19 uncertainty in the source term?
20 A (WITNESS BEYEA) Yes, that is correct.
21 Q Have you -- are you familiar with a document
22 entitled PRA Procedures Guide, NUREG-2300, dated
23 September 28, 1981?
24 A (WITNESS BEYEA) I have seen it, but I have
25 not really paid that much attention to it.

1 Q I would like to show you a table from that
2 document. It is Table 9-15.
3 JUDGE CARTER: Ms. Moore, would you like this
4 sheet identified?
5 MS. MOORE: Yes, sir, I would.
6 JUDGE CARTER: This would be, I think, the
7 first staff exhibit.
8 MR. HASSLE: I believe it will be the second.
9 I believe the first staff exhibit was PM-1.
10 JUDGE CARTER: And you've used Mr. McIntire's
11 initials on that.
12 MS. MOORE: That's right. This would be NRC
13 Staff Exhibit 2.
14 JUDGE CARTER: We'll make this Exhibit S-1,
15 and I note that it reads "Table 9-15, Properties of
16 Source Term -- Sensitivities and Uncertainties," and
17 what is the source of this document?
18 MS. MOORE: The source of this document is a
19 document entitled "A Guide to the Performance of
20 Probabilistic Risk Assessments for Nuclear Power
21 Plants." The NUREG number is NUREG-CR-2300, and it is
22 dated September 28, 1981.
23 JUDGE CARTER: And this appears to be page
24 9-95.
25 (The document referred to

1 was marked Exhibit S No.
2 1 for identification.)
3 JUDGE CARTER: Proceed.
4 BY MS. MOORE: (Resuming)
5 Q In that table, isn't it correct that the
6 magnitude of the source term is a major contributor to
7 uncertainties in the assessment of consequences?
8 MR. BLUM: Your Honor, I have to object.
9 There hasn't been a foundation laid of finding out
10 whether the witness is familiar with this table or with
11 the surrounding text that goes with the table, and that
12 really does have to come first before he is questioned
13 on it.
14 JUDGE CARTER: Ms. Moore, would you repeat
15 your question?
16 MS. MOORE: I had previously asked if the
17 witness was familiar with the document. If it will
18 help, Mr. Blum, I will ask him if he's familiar with
19 this table.
20 MR. BLUM: Yes.
21 BY MS. MOORE: (Resuming)
22 Q Dr. Beyea, are you familiar with this table?
23 A (WITNESS BEYEA) This is a standard kind of
24 analysis that appears in many places.
25 JUDGE CARTER: Mr. Blum, I'm not sure that

1 witness familiarity with this table is necessary for
2 questions to be asked with regard to the document. If
3 it is part of a document with which he says he is
4 familiar, I think it is permissible to ask questions
5 with regard to part of it.
6 MR. PLUM: He said he had seen the document
7 but didn't know it very well, but it sounds like the
8 witness is now saying he is able to answer questions on
9 the table.
10 WITNESS BEYEA: I would have to point out that
11 the table I think is mislabeled. It says properties of
12 source term, and it appears to be a table of certain
13 sensitivities and uncertainties, and one of those is a
14 source term, but with that proviso, with that
15 clarification, I certainly feel able to answer questions
16 about sensitivities, about consequence studies, having
17 made many such studies myself.
18 BY MS. MOORE: (Resuming)
19 Q I only have one question, and that is does
20 that table indicate that the magnitude of the source
21 term is listed as a major contributor to uncertainties
22 in the assessment of consequences?
23 A (WITNESS BEYEA) [illegible] that is an absolute
24 given in this field. It depends upon what release
25 scenario you -- what release of radioiodides you begin

1 with, and if you have less, you have lower consequences,
2 and if you have more, you have much worse consequences.
3 That is the overall key uncertainty in consequence
4 analysis.
5 Q So your answer then is yes.
6 A (WITNESS BEYEA) Yes.
7 Q Have you explored the sensitivity of the
8 consequence calculations in your testimony to this
9 uncertainty in the source term?
10 A (WITNESS BEYEA) Yes, I have.
11 Q Are these sensitivity studies included in your
12 testimony?
13 A (WITNESS BEYEA) There is one reference to the
14 fact that latent cancer deaths can be scaled with the
15 release of certain isotopes. There is no sensitivity
16 analysis given explicit for the early death threshold
17 calculations that are performed.
18 Q Moving on to your dispersion model, is it
19 correct to say that in your analysis you used a plume
20 width of 7 1/2 degrees throughout your whole analysis?
21 A (WITNESS BEYEA) No, it is not correct. Let
22 me clarify that.
23 The only time 7.5 degree plume width was used
24 was to calculate exposed populations. In all other
25 calculations a gaussian model was used.

1 Q Could you tell me what the width of the
2 gaussian model you used was?
3 A (WITNESS BEYEA) I think the way to refer to
4 it is the fact that the parameter that determines the
5 characteristic of the gaussian is given by the so-called
6 horizontal dispersion parameter, the socalled sigma $_y$,
7 and that was taken from the reactor safety study
8 Pasquill-Gifford within 0-10 miles. When we went to the
9 New York City case, which was beyond 10 miles, it was
10 necessary to switch dispersion coefficients because it
11 was only Briggs who gives urban dispersion
12 coefficients.
13 So to go back, the parameter in gaussian
14 horizontal direction is given by the Pasquill-Gifford
15 value from 0-10 miles. From 10 to 20 miles we are using
16 Briggs -- Briggs' rural parameters, and then from 20
17 miles on in the New York City direction we are using
18 Briggs' urban dispersion coefficients.
19 JUDGE SHON: Dr. Beyea, I think what might be
20 giving us some difficulty here is I don't think it is
21 immediately obvious, certainly not immediately obvious
22 to the layman, that the use of sigma $_y$ as a function
23 of distance necessarily generates a path track that is
24 approximateable, that can be approximated by a segment
25 with straight sides.

WITNESS BEYEA: With a wedge.

JUDGE SHON: With a wedge.

Can you tell us how different that really is and why it should be that a wedge approximates this always over the range of parameters you are using?

WITNESS BEYEA: It has to do with the fact that at a certain distance away from the center plume, the gaussian concentration falls off very rapidly, and therefore as a first approximation, one can use a wedge with a total width of three times the sigma $_y$ value. That is what we have.

Now, we do have actual wedge numbers that can give you some more information.

JUDGE SHON: I think you need more facts, and that is not only that three sigma decides the size of the plume, which it does for the gaussian, but also that three sigma goes up proportional to distance.

Don't you need that, too?

WITNESS BEYEA: Yes, sigma does change. It increases downwind. It is approximately linear but slightly less than linear in the models that we used.

JUDGE SHON: That is the kind of thing I wanted you to say, that it was approximately linear.

WITNESS BEYEA: Yes, approximately linear with distance.

1 For example, at ten miles the wedge size would
2 be 8.7 degrees where at fifteem miles it would be 7.6
3 and at twenty miles it would be 6.8. At twenty-seven
4 miles it would be 6 degree, thirty-five miles it would
5 be 5.4 degrees. So strictly speaking, there is no one
6 wedge, and to make things simpler in the table, we just
7 picked one angle and then later we did check it to see
8 whether in fact we got roughly the same numbers, and we
9 did.
10 JUDGE SHON: I think your Figure 5 on page 39
11 looks kind of distorted in the direction that you said
12 it goes. It isn't really quite a leg. The sides kind
13 of bend in a you go.
14 WITNESS BEYEA: That is right, but in trying
15 to describe what happens to people who are not that
16 mathematically inclined, I think a wedge is about the
17 best you can do.
18 JUDGE SHON: Thank you.
19 I didn't mean to interrupt, Ms. Moore. Go
20 ahead, please.
21 MS. MOORE: That's quite all right.
22 BY MS. MOORE: (Resuming)
23 Q So as I understand it, you are telling me that
24 the width of your gaussian is approximately three
25 sigma. Would that be a fair statement? It may vary as

1 the wedge goes with distance?

2 A (WITNESS BEYEA) Well, three sigma varies with

3 this since it is sigma, and three sigma varies with

4 distance.

5 Q And your close-in plume, as I understand it,

6 has a width of 7 1/2 degrees.

7 A (WITNESS BEYEA) Well, I read you the values

8 that it would have, but we did the calculation for the

9 population tables to three and four to make the analysis

10 simple and easily traceable. We just picked 7.5 to do

11 the population calculations.

12 Q And that includes a wind meander factor within

13 it, is that correct, that 7.5 degrees?

14 A (WITNESS BEYEA) 7.5 degrees as it reflects

15 the sigma includes fluctuations of the wind. It does

16 not include gross wind changes, but it does include

17 random small fluctuations in wind direction.

18 I should add that the sigmas are based on

19 semi-empirical data, based on actual measurements of

20 plume dispersion.

21 Q Is it correct that looking at the plume that

22 you have modeled in the direction of travel -- that

23 means, coming toward you -- well, for my benefit, I am

24 defining that as looking at it coming toward you or

25 going away from you, it would look like a rectangle, is

1 that correct?

2 JUDGE PARIS: You mean a cross section of the

3 plume?

4 MS. MOORE: Yes.

5 WITNESS BEYEA: The cross section of the

6 plume? No, because it has a vertical gaussian

7 distribution, so we do use a complete gaussian in the

8 vertical direction.

9 JUDGE CARTER: Would the word "side view"

10 change the way you would describe it? Would the side

11 view be more like a rectangle?

12 WITNESS BEYEA: A side view looks like a

13 wedge, like an increasing wedge going up. Well, I mean

14 if you look at our figure, the best side view is given

15 in our figure in the text.

16 JUDGE SHON: I think the word "side view" may

17 be confusing because it is a question of which side you

18 are looking at.

19 JUDGE CARTER: Excuse me. As a matter of

20 personal privilege, the witness used the words "side

21 view."

22 WITNESS BEYEA: Yes, that was my loose

23 language.

24 I think Figure 2 and Figure 1 show about the

25 best I can do. Figure 2 on page -- well, Figure 1 shows

1 a wedge on page 12. In reality, the wedge is not a
2 perfectly straight line. It is a curvy wedge.
3 On Figure 2, there is no simple way to
4 describe the shape of the plume. It has a maximum
5 concentration at the effective release height, and then
6 a concentration that varies about that or gradually
7 drops off.
8 JUDGE PARIS: We have in your testimony a top
9 view and a side view, and my understanding was that Ms.
10 Moore wanted to know if a cross sectional view would be
11 rectangular, and you said no.
12 What would a cross sectional view of the plume
13 be, let's say, beyond the effective release height but
14 before it touches the ground in Figure 2?
15 WITNESS BEYEA: It would have a straight --
16 there is a concentration distribution. If I go to
17 the -- there is no simple picture. It would be a fuzzy
18 cloud.
19 JUDGE PARIS: The margins of the cloud would
20 be fuzzy, but if we picked some dose level and so many
21 isoclimes --
22 WITNESS BEYEA: Then it would be a rectangle.
23 JUDGE PARIS: Does that satisfy you, Ms.
24 Moore?
25 MS. MOORE: Yes.

BY MS. MOORE: (Resuming)

Q I am going to ask you a question -- I phrased it before but I think maybe I didn't phrase it quite correctly, and that is, is your plume width a three sigma from point of release to all distances downwind?

A (WITNESS BEYEA) Well, close to the plant we have to take into account turbulence of the building, and so the σ_y never, never goes below the size of the building which we take to be 50 meters vertical and eleven meters horizontal, or is it the other way around? I can't remember which.

Q Is it possible for you to find that for me?

A (WITNESS BEYEA). Yes.

Q Thank you.

(Pause)

A (WITNESS BEYEA) The minimum σ_y is 33 meters and the minimum σ_z is 12 meters.

Q Thank you.

Let me ask you this. If one narrows the plume, the width of the plume, is it correct that the concentrations of radioactive material in that plume increase?

A (WITNESS BEYEA) Yes, it is.

Q And wouldn't it be correct that an increase in the concentration of the radioactive materials in the

1 plume would result in a shorter time in which a dose
2 would accumulate to, say, a level of 200 rem?
3 A (WITNESS BEYEA) Yes.
4 Q Then an increase in the concentration of
5 radioctivity -- I can't even say it -- of radioactive
6 material in a plume would also increase the probability
7 of early death at a given dose level, is that correct?
8 A (WITNESS BEYEA) Yes.
9 Q Now, in Table 7 of your testimony on page 42,
10 is it correct that that table calculates land
11 contamination out to 1600 miles?
12 A (WITNESS BEYEA) That is correct.
13 Q Now, in conditions of Class D stability with
14 winds of 4 meters per second, have you calculated how
15 long it would take for the plume to travel that distance
16 of 1600 miles?
17 A (WITNESS BEYEA) Of course I did. It is --
18 that's 8 miles an hour, so we are talking about 200
19 hours.
20 Q Could you tell me approximately how many days
21 that would be?
22 A (WITNESS BEYEA) That is about eight days.
23 Q Have you estimated the likelihood that the
24 meteorological conditions existing at the time of
25 release would remain the same for that period of eight

1 days?

2 A (WITNESS BEYEA) We don't have to pretend that

3 the wedge would be in one particular direction. The

4 area refers to the area in the net shape of the curve,

5 and over that period of time it would have to shift

6 directions.

7 Q So you are not assuming, then, that it

8 followed just one direction. Is that what you are

9 saying?

10 A (WITNESS BEYEA) I am assuming that if I did a

11 curve trajectory calculation, that I would come out with

12 initially the same size area, and I have essentially

13 documented that in a report that is referenced in my

14 testimony. I did a calculation comparing the actual

15 contamination in the wind scale accident in England, and

16 doing the same calculation, one got a factor of two of

17 the actual area that was contaminated with radioiodine.

18 JUDGE SHON: Dr. Beyea, do your figures allow

19 for cloud depletion?

20 WITNESS BEYEA: Yes, that is what is covered

21 hewre.

22 JUDGE CARTER: Dr. Beyea, in that example with

23 the 1600 mile length of wedge, what would be the

24 elevation of the cloud?

25 WITNESS BEYEA: Well, by that time it would

1 have spread out uniformly up into the mixing layer, so
2 we would have had a height of abot on the average 3000
3 meters, or 3000 feet high, spread out over, uniformly,
4 up to abouit 3000 feet.
5 JUDGE CARTER: How do you determine that?
6 WITNESS BEYEA: Well, there is a phenomenon in
7 the atmosphere at which point, due to various thermal
8 processes, where there is a lid, a lid on additional
9 rising above a certain point, and therefore there is a
10 point at which you do not get much penetration beyond
11 1000 meters. Now, 1000 meters is an average. It can
12 fluctuate around that point.
13 JUDGE CARTER: Is that determination a result
14 of a specific study that has been made?
15 WITNESS BEYEA: For instance, in the reactor
16 safety study, in Volume 6, they give examples of the
17 mixing layer for their instability classes, and 1000
18 meters is an average value for D stability class.
19 JUDGE SHON: It would be quite different for
20 the stability classes E or F, wouldn't it? It would be
21 lower?
22 WITNESS BEYEA: Yes, but we are looking here
23 at an average over a long period of time, and the
24 average conditions would be D stability class, which are
25 correct. But I must point out that land contamination,

1 it turns out that total area turns out to be relatively
2 insensitive to sigma y for a number of reasons, for
3 releases of the magnitude which you are talking here.
4 That is discussed in the report that I did when I was at
5 Princeton.
6 JUDGE SHON: Why is that?
7 WITNESS BEYEA: Well, let's see if I can
8 recall.
9 Sigma y s turn out to cancel each other in a
10 certain region. Let me see if it makes sense. In a
11 certain region, if you spread out the area, you get a
12 wider wedge but a shorter wedge, and if you have a
13 narrow one, you get a longer wedge, but the area is
14 approximately the same.
15 If the concentration falls in a certain region
16 which happens to be about what you get in a BWR 2, if
17 you get ten times lower or ten times greater releases,
18 it tends not to be quite so simple, and then it does
19 depend on the variou sigmas.
20 JUDGE SHON: I see. Thank you.
21 I'm sorry to have interrupted again, Ms.
22 Moore. Go ahead.
23 WITNESS BEYEA: I think I should clarify.
24 There is a point here which I think the question is
25 getting at, and that is at this site would in fact some

1 of this area occur over the ocean, because it might
2 start going west, but then it would come back to the
3 east, and I think that is certainly reasonable, a
4 reasonable point here, and I think you would most likely
5 expect some of that 1600 miles to occur over water and
6 therefore not be a problem.
7 JUDGE SHON: You go 1600 miles in certain
8 directions and you are already in the Atlantic Ocean I
9 trust.
10 WITNESS BEYEA: Well, you can go up toward
11 Maine, you can probably get 800 mile toward Maine.
12 JUDGE CARTER: I get the impression from your
13 earlier answer with regard to the probable or possible
14 height of the material that temperature is not a
15 factor?
16 WITNESS BEYEA: Temperature of the air? Well,
17 temperature distribution in the air is important. That
18 is what sets the lid. You get a temperature inversion,
19 that keeps the material from rising above a certain
20 point. So temperature distribution is important.
21 JUDGE CARTER: You assume an inversion?
22 WITNESS BEYEA: Again, I base it on -- the
23 inversions we are talking about here are very high up.
24 These are not your low level inversions of 200 meters.
25 We are talking about inversions at 1000 meters. So

1 there is -- there tends to be during most part of the
2 day, there tends to be an inversion lid on the
3 atmosphere. Sometimes it's as high as 3000 meters and
4 not 1000. Sometimes it is lower, as low as 300 meters.
5 JUDGE SHON: If you had thunderstorms or
6 hurricanes, things like this, these change.
7 WITNESS BEYEA: Yes, that could certainly
8 bring the stuff right up into the atmosphere, very high
9 up, and disperse it.
10 BY MS. MOORE: (Resuming)
11 Q Dr. Beyea, as the plume rises, the
12 concentrations of radioactive material at ground level
13 are reduced, is that correct?
14 A (WITNESS BEYEA) Near the plant, that is
15 correct.
16 Q On page 32 of your testimony, in Footnote E to
17 Table 4, you state that you have used the Briggs
18 formulat for calculating plume rise. Is that correct?
19 A (WITNESS BEYEA) That is not quite correct.
20 We used that as the mid-range value of the plume rise.
21 That is our mid-range calculation for plume rise, and we
22 used the Briggs formula for that.
23 Q Could you tell me what you used for your other
24 ranges?
25 A (WITNESS BEYEA) Yes, the low -- you start off

1 with an initial release point from the reactor which we
2 take as 25 meters. Then you add on to it a plume rise.
3 A low plume rise in our calculations is one-third of the
4 Briggs calculated plume rise. A high plume rise is
5 three times the Briggs formulation. And that number was
6 based on the fact that the range of plume rise formulas
7 appearing in the literature varies in total by about a
8 factor of ten, and thus what we did was -- well,
9 actually -- well, at the suggestion of Dr. McGrath, we
10 modified the formulation that we had taken in the
11 Swedish study, and instead of just taking the range,
12 which is in published literature, we varied the range
13 about the Briggs formula.
14 Q From one-third to three, is that correct? Is
15 that my understanding?
16 A (WITNESS BEYEA) Well, let me give you an
17 example. Suppose the Briggs prediction was for a 100
18 meter rise above the release point. Let us suppose the
19 release point were 25 meters. Then the Briggs
20 prediction would be 125 meters.
21 Our low plume rise would be 25 meters plus
22 one-third of 100, or 33, for a total of 58 meters. Our
23 high plume rise would be 25 meters, plus three times the
24 Briggs formula, 300, for a total of 325 meters. And I
25 am saying that that range of 125 meters to 325 meters

1 spans the data on theoretical plume rise formulas.

2 Now, I must point out that the Briggs formula

3 varies with wind speed and stability class, so the

4 actual range in meters changes with stability class and

5 with wind speed.

6 Q Am I correct in understanding that the range

7 you have described is the range of uncertainty in plume

8 rise, is that correct?

9 A (WITNESS BEYEA) That is correct.

10 Q And in calculating early fatalities, you used

11 only the low plume rise?

12 A (WITNESS BEYEA) That is not correct. It is

13 absolutely not correct, and somehow we managed to

14 confuse I think everyone who read the testimony, and I

15 apologize for that.

16 So let me try and clarify that.

17 We took as a baseline case the Briggs

18 theoretical formula. In preparing tables, the major

19 ERPA tables in our Appendix B are all calculated using

20 the Briggs plume rise formula. However, we also pointed

21 out that if the plume rise should be low, then the

22 situation was considerably worse and that under many,

23 many more weather conditions you reach the 200 rem

24 threshold.

25 I also should point out, though, if you

1 believe that the supportive treatment curve was correct,
2 and therefore you have a 350 rem threshold, then the
3 occurrence of the low plume rise becomes much more
4 significant. But if you look at the 200 rem threshold,
5 that even with the Briggs formula, you have a
6 significant risk of early death within ten miles, so
7 that in fact our statements were based -- most of the
8 statements that I read in my summary were based on the
9 Briggs theoretical formula for plume rise.
10 Q Could you tell me, Dr. Beyea, which Briggs
11 formula for theoretical plume rise you employed?
12 A (WITNESS BEYEA) I used the one that was given
13 in the reactor safety study. The actual values in
14 Volume 6 were not as clear as one would like, and so I
15 was given a copy of the CRAC manual, and I used the
16 formula that was given in the CRAC manual, CRAC being
17 the standard NRC Computer Code for Consequence
18 Modeling.
19 Q Is that the 1969 formula, do you know?
20 A (WITNESS BEYEA) I am not sure which. Briggs
21 has a number of formulas, and I'm not sure which one
22 this is.
23 Q Could you identify by title the manual you are
24 referring to?
25 A (WITNESS BEYEA) Yes.

1 All I have is a photocopy of the CRAC Users
2 Manual, an edition that was sent to me in 1978, so it
3 would have been a version that accompanied the computer
4 tape in 1978. I don't have any other information about
5 it.
6 Q I'm sorry, I didn't hear you.
7 A (WITNESS BEYEA) I do not have a specific date
8 on the CRAC users manual that accompanied the computer
9 tape.
10 Q Okay, thank you.
11 In Table 2 of your testimony, you present the
12 range of health consequences, various ranges of health
13 consequences per million person rem derived from several
14 studies, is that correct?
15 A (WITNESS BEYEA) That is correct.
16 Q And one of the studies you cite is the BIER
17 report, BIER 3 of 1980, is that correct?
18 A (WITNESS BEYEA) Yes.
19 Q Was your basis for that range Table 5-4?
20 A (WITNESS BEYEA) That is indicated in Footnote
21 A, and that is correct.
22 Q Do you have a copy of that table with you?
23 A (WITNESS BEYEA) Yes, I do.
24 Do you have the page number to help me?
25 Q Page 147.

1 A (WITNESS BEYEA) Thank you.

2 Q Is it correct that the lower bound figure in

3 your range of 50 to 500 -- I am sorry. I withdraw

4 that.

5 Isn't it correct that your lower bound figure

6 that you cite from the BIER report is taken from the

7 column which represents the absolute risk from

8 continuous lifetime exposures?

9 A (WITNESS BEYEA) Yes, it is.

10 Q And the upper bound figure taken from the BIER

11 report comes from the column in that table which is

12 entitled "The Relative Risk Model for Single Exposures,"

13 is that correct?

14 A (WITNESS BEYEA) That is correct.

15 Q Is it correct that to support your range of

16 latent cancer incidents per million person rem, you

17 selected values from an absolute risk model?

18 A (WITNESS BEYEA) The lower level, the lower

19 limits come from an absolute risk model whereas the

20 upper limits come from a relative risk model.

21 Q Okay.

22 In that table in the BIER report, isn't there

23 also a range of data from the UNSCEAR Report of 1977?

24 A (WITNESS BEYEA) Yes, there is.

25 Q Could you explain why that range is not

1 included in Table 2 of your testimony?

2 A (WITNESS BEYEA) Well, there simply is a lack

3 of space. It falls within the range of 50 to 500. It's

4 given a 75 to 175.

5 Q Now, in your curves of probability of

6 mortality, I believe that's what they are on page 18 of

7 your testimony, the curves that depict the relationship

8 between individual radiation dose and the probability of

9 mortality --

10 A (WITNESS BEYEA) Yes.

11 Q With supportive and minimal treatment, you've

12 shifted those curves down by 25 rem, is that a correct

13 understanding, from the WASH-1400 curves?

14 A (WITNESS BEYEA) Yes, as we discussed

15 yesterday.

16 Q Right.

17 Is it correct that a downward shift in these

18 curves increases the probability of early mortality at a

19 given dose level?

20 A (WITNESS BEYEA) Yes.

21 Q I think it was just your previous testimony --

22 and you can correct me if I am wrong -- minimal

23 treatment is anything less than the definition of

24 supportive medical treatment in WASH-1400, is that

25 correct?

1 A (WITNESS BEYEA) That is my understanding,
2 yes.
3 Q Are you aware of any definition in WASH-1400
4 of minimal treatment?
5 A (WITNESS BEYEA) I believe there is such a
6 definition, yes.
7 Q Do you know where that definition is located?
8 A (WITNESS BEYEA) I do not, but I believe that
9 I will try to find it at the break.
10 Q Thank you.
11 JUDGE CARTER: Ms. Moore, we expect to go
12 about another four or five minutes and then break. Then
13 we will break for lunch for an hour and return.
14 So at any convenient point here. I don't want
15 to stop you in the middle of a subject.
16 MS. MOORE: I can stop here. I have just one
17 or two more questions, but it is a different line of
18 questioning.
19 JUDGE CARTER: Well, suppose we break right
20 here, and we'll try to return by 1:15, if possible.
21 (Whereupon, at 12:12 o'clock p.m., the hearing
22 in the above-entitled matter recessed, to reconvene at
23 1:15 o'clock p.m. the same day.)
24 - - -
25

1 AFTERNOON SESSION

2 (1:25 p.m.)

3 JUDGE CARTER: On the record.

4 We will interrupt the examination of the

5 witnesses for a short period of time to hear the

6 discovery motion. Mr. Sohinki, I would appreciate it if

7 more than one issue is included in your request for

8 relief that we handle them one at a time so that the

9 record will be complete.

10 So if you are ready to proceed, Mr. Sohinki,

11 what is the issue?

12 MR. SOHINKI: Basically there were three

13 motions on the floor at the beginning of the week, Mr.

14 Chairman. The first had to do with our previous motion

15 to compel with regard to UCS regarding Questions 3 and 4

16 interrogatories. As you recall, the Board, in its June

17 25 written order, required that those responses be

18 hand-served on July 1 at 10:00 a.m.

19 We did not receive them on July 1. However, I

20 have now received the Questions 3 and 4 responses. They

21 were Federal Expressed from UCS in Washington to the

22 hotel where we are staying and I received those on

23 Wednesday, I believe.

24 In one sense, that moots that motion. In

25 another sense, as I mentioned the other day, we are

1 extremely upset by the fact that we continually have to
2 make these motions and that parties in these proceedings
3 have taken the opportunity to delay responses to
4 discovery requests past the due date provided by the
5 Rules of Practice.
6 Now it seems to me just as a matter of
7 courtesy if a party cannot respond by the due date, then
8 as a matter of courtesy they ought to inform opposing
9 counsel several days in advance of the due date that
10 they are having a problem, they need an extension. But
11 we received no request for extension of time either
12 formally or informally from the parties involved in
13 these motions and I just think as a matter of courtesy
14 we should have received an extension.
15 JUDGE CARTER: I think that is correct. But
16 since the matter is moot, we will have to move on. We
17 said before we expect all of the parties to comply with
18 the time requirements. It makes matters very difficult
19 when they do not comply, although I do understand there
20 may be reasons of excuse. But, as Mr. Sohinki puts it,
21 there is no reason why you can't call up and advise in
22 advance when material is going to be delivered.
23 MR. BLUM: Your Honor, in fact with regard to
24 this first issue, we did comply scrupulously with the
25 time limits. We Federal Expressed a copy to Con Edison

1 and hand-delivered one to Morgan and Associates in
2 Washington. The difficulty was that on the service list
3 they did not have Mr. Brandenburg's specific office
4 number listed and sometimes they have trouble within the
5 Con Edison building delivering things and we do have a
6 Federal Express receipt in Washington.
7 Mr. Sholly will swear that he personally did
8 deliver it to Morgan and Associates on the day that it
9 was due as well.
10 JUDGE CARTER: Well, maybe you can clarify
11 that to make sure in the future it doesn't occur again
12 by giving your room number or box number.
13 MR. SOHINKI: I think for purposes of the
14 service list we might say at this time that the room
15 number should be included on the service list to avoid
16 any of these problems in the future. I think Mr.
17 Brandenburg's room number is 1822.
18 I might, however, note that, as Mr. Blum
19 indicated, the responses were Federal Expressed on July
20 1. That strictly was not in compliance with the Board's
21 order, which stated that they were supposed to be
22 hand-delivered July 1.
23 MR. BLUM: It is my belief they were Federal
24 Expressed the day before July 1 to get there by July 1.
25 JUDGE CARTER: Well, the material has been

1 received. I don't think there is any substantial
2 disagreement. No one disagrees with your principles,
3 and they in good faith have said they would try to
4 comply with what was required.
5 MR. SOHINKI: All we ask in the future if
6 there is a problem complying with the time deadline that
7 we be informed in advance. That's all.
8 JUDGE CARTER: Yes.
9 MR. SOHINKI: With regard to the motion to
10 compel the Greater New York Energy Council responses on
11 our interrogatories with regard to Question 6, those
12 responses were due on June 23. We have not received any
13 responses. However, we were informed by Mr. Blum that
14 Mr. Corren expects to have those responses on July 13.
15 We would, therefore, request that the Board
16 issue a motion to compel Mr. Corren's responses by July
17 13, hand-delivered in our offices, and that if those
18 responses are not delivered that Mr. Corren be
19 prohibited from introducing evidence or cross-examining
20 on those issues.
21 I might note that those responses, if received
22 on July 13, would be three weeks later than the
23 deadline. Again, we received no advance notification
24 from Mr. Corren that he would have a problem complying
25 and I might note that we, after Mr. Blum's prodding of

1 two weeks ago, did respond to Mr. Corren's
2 interrogatories in a timely manner.
3 JUDGE CARTER: Mr. Blum?
4 MR. BLUM: Yes. Mr. Corren is an individual
5 who doesn't have a secretary. He was served a
6 voluminous number of interrogatories going well beyond
7 his contentions, some of them requiring significant
8 research. Mr. Corren wanted to object to these and to
9 move for a protective order, and I suggested instead
10 that he just do the best that he could with them and get
11 them done as soon as he could.
12 He could not get it done strictly within the
13 two weeks because he just had too many other
14 commitments, but did make the commitment by having it
15 done or having it delivered by next Tuesday. He has now
16 finished everything but the final typing. I talked with
17 him last night. They will be here by next Tuesday.
18 I don't think there is any need for any
19 particular harsh order at Mr. Corren. This was an
20 instance where, if we had wanted to, we could have
21 litigated the proprietry of unnecessary interrogatories,
22 possibly used partially for harrassment and just trying
23 to sink a small Intervenor, but we chose not to. We
24 chose to reply as rapidly as he could.
25 JUDGE CARTER: If there is any problem with

1 the delivery on the 13th, we will hear further argument
2 on it by telephone.
3 MR. SOHINKI: May we have a motion to compel
4 the responses by July 13 at the very latest?
5 JUDGE CARTER: Mr. Blum has advised me that he
6 is authorized -- I take it you are authorized by Mr.
7 Corren to tell the Board that they will be delivered on
8 July 13?
9 MR. BLUM: Yes.
10 JUDGE CARTER: That is sufficient. If you do
11 not get them on the 13th, you can call us on the 14th.
12 MR. SOHINKI: I want to note on the record we
13 take strong exception to Mr. Blum's allegation of
14 attempted harrassment in propounding interrogatories.
15 We propounded interrogatories that we believe are in
16 every case relevant to the contentions in this
17 proceeding and the Commission's questions.
18 And if any party has a legitimate basis to
19 object to those interrogatories, let us hear it. But
20 again, Mr. Corren could have filed objections. He
21 didn't by the due date and, again, we received no
22 advance notification that he would have a problem
23 responding by the due date.
24 JUDGE CARTER: What is your next request?
25 MR. SOHINKI: The last motion to compel was

1 with regard to interrogatories that we propounded
2 concerning Commission Question 1. Those interrogatories
3 were propounded to UCS, NYPIRG, FOE, Audubon and
4 Parents. To date we have received nothing with regard
5 to those interrogatories.
6 We were informed by Mr. Hartzman on behalf of
7 FOE-Audubon, I believe yesterday, that they intend to
8 hand deliver their responses on July 13. We have
9 received nothing from either of the other parties.
10 Mr. Blum can more adequately represent UCS'
11 position on these interrogatories than I, but I
12 understand from discussions with Mr. Blum that it is
13 their position that those interrogatory responses may
14 now be due on August 2, since that is the date set forth
15 in the Board's latest discovery order.
16 I might note with regard to that position that
17 in the Board's order with regard to Questions 3 and 4
18 interrogatories, which stated that the latest date for
19 receipt was May 31, the Board made quite clear
20 subsequent to issuing that order that they did not
21 intend to disturb the normal response times in the
22 Commission's rules of practice and, therefore, it is our
23 position that those interrogatory responses are now due
24 and have been due since July 1, and that UCS, NYPIRG,
25 and Parents and, for that matter, FOE-Audubon, are

1 seriously late in responding to those interrogatories.

2 JUDGE CARTER: Is Mr. Hartzman here?

3 MR. BLUM: No, he is not. He did speak to me

4 last night about what he would say.

5 JUDGE CARTER: And what is Mr. Hartzman's

6 position on this matter?

7 MR. BLUM: About July 13?

8 JUDGE CARTER: He will file?

9 MR. BLUM: Yes. He will have it in on the

10 13th.

11 JUDGE CARTER: What about Parents? Is anyone

12 here from the Parents organization?

13 MR. BLUM: Miss Posner was here earlier this

14 morning. She will probably be returning later.

15 JUDGE CARTER: All right. Now, with regard to

16 UCS and NYPIRG.

17 MR. BLUM: Well, first I did suggest that we

18 get clarification from the Board on the meaning of the

19 language in its order, which on the face of it was

20 ambiguous. Mr. Sohinki's interpretation is one

21 reasonable interpretation.

22 JUDGE CARTER: The order did not obligate or

23 change any existing rules or regulations or time for

24 answering. Had we intended to do so, we would have said

25 so. But since interrogatories are continuing, we would

1 have had to provide for a time limit on that. I think
2 it would be proper under the circumstances for you to
3 have those. Can you get your answers filed by Tuesday
4 the 13th?
5 MR. BLUM: Well, let me divide it into two
6 parts, one of which we have already answered. We were
7 informed at the time that there were ten questions which
8 related to Dr. Beyea's testimony and we wanted to get
9 answers to them as rapidly as possible on those in order
10 not to disrupt the scheduling of the Beyea-Palenik
11 testimony.
12 What happened with those is Dr. Beyea -- well,
13 initially we asked to have a copy sent to Dr. Beyea and
14 the Licensees refused and NYPIRG, after searching its
15 files, managed to get a copy and read it to Dr. Beyea,
16 who said all of the questions that were being asked were
17 fully answered in the testimony itself.
18 Mr. Sohinki then asked me over the phone and
19 said well, it is not completely clear to use where in
20 the testimony it is. So I spent two phone
21 conversations, totalling something over an hour, going
22 through the testimony with Mr. Sohinki to help him
23 locate where in the testimony it was.
24 At the end of this, after we had really gone
25 through with a kind of almost quasi-deposition of me in

1 order to interpret the testimony, Mr. Sohinki turned
2 around and said okay, now we want your formal written
3 responses to the questions. And the formal written
4 responses would be, to each question: "See testimony,
5 such-and-such page," which I had given him orally in
6 order to speed up his discovery of the substantive
7 matters.
8 So it is our position that those ten questions
9 have been answered.
10 JUDGE CARTER: What about the balance?
11 MR. BLUM: Okay. The balance, we have
12 somewhat of a problem in that UCS has retained an expert
13 on probabilistic risk assessment, but he is not yet
14 really working for us because he has other proceedings
15 that have to come first and his testimony is not due for
16 quite a while down the road.
17 We are in the position of either having to
18 give general answers based, for example, on my knowledge
19 of probability, which I presume is not what the
20 Licensees want, or to in turn get some extension of time
21 to enable the expert to have time to give his answers to
22 those, or at least to have input into them.
23 We had requested that Mr. Sohinki consult with
24 Ellyn Weiss, who is handling this portion of the
25 discovery, because she is in contact with the expert. I

1 don't know whether they consulted.

2 JUDGE CARTER: What is the expert's name?

3 MR. BLUM: Dr. Weatherwax.

4 JUDGE CARTER: And what happened after that?

5 MR. BLUM: Has Mr. Sohinki consulted with Miss

6 Weiss?

7 MR. SOHINKI: No, sir, I haven't. Mr. Blum, I

8 might --

9 JUDGE CARTER: You did not call here because

10 of technical reasons?

11 MR. SOHINKI: You know, we had this

12 conversation Friday afternoon. I just have not had a

13 chance, nor do I believe I should have to contact Miss

14 Weiss. Mr. Blum is UCS' main representative in this

15 case. He certainly is capable of adequately

16 representing whatever the position of UCS-NYPIRG is in

17 this matter.

18 JUDGE CARTER: But, Mr. Sohinki, I asked you

19 on Monday or Tuesday, when this matter was first brought

20 to my attention, to attempt to resolve the problem. I

21 do not consider refusing to call the attorney who is

22 handling that part of the case cooperation in resolving

23 that part of the problem.

24 MR. SOHINKI: Mr. Blum, Mr. Chairman,

25 represented to me that their position was that they were

1 not responsible for having those responses to us on the
2 date they were due. Now I took that as the UCS
3 position.
4 JUDGE CARTER: I think you should have called
5 Miss Weiss -- she was here -- for a statement at the
6 beginning of the testimony. Miss Weiss was here during
7 the week. I think you should have spoken to her. If
8 the problem was solely that as opposed to finding out
9 when the answers would be available -- solely one of
10 interpretation of the order, we certainly would have
11 provided you with an answer, as we did when Mr. Levin
12 had a request.
13 Now, Mr. Blum, that testimony is due to be
14 filed on August 17, but I would not consider it proper
15 and forthright for UCS-NYPIRG to postpone answers until
16 the 17th when the testimony is filed. I don't want to
17 get into that situation again. I will say frankly that
18 more and better discovery might have moved this entire
19 record along much faster and it has become apparent
20 perhaps the Board shares some of the blame for that in
21 making it too restrictive.
22 But in any event, if Mr. Weatherwax or Dr.
23 Weatherwax cannot be available within a reasonable time
24 for pre-trial discovery and for filing his testimony,
25 then I really think you will have to consider getting

1 another witness.

2 MR. BLUM: Your Honor, could we have an

3 extension until July 26 to answer these? They are quite

4 lengthy, the interrogatories.

5 MR. SOHINKI: Mr. Chairman, may I make a point

6 with regard to that? Mr. Blum, on behalf of UCS-NYPIRG,

7 has proferred certain contentions in this case. Now

8 when they proffered those contentions, they must have

9 had something in mind to support the contentions. They

10 must have had a basis for them.

11 The interrogatories go to the basis for the

12 allegations UCS-NYPIRG has made in these proceedings.

13 JUDGE CARTER: Mr. Sohinki, we cannot look

14 behind the filings and the statements of counsel in an

15 effort to go through either their thought proceses or

16 the actions they took and discussions with their

17 witnesses or the evidence.

18 They have a duty to provide the witness for

19 examination for a reasonable time prior to that. If it

20 develops there is no time for the answering of

21 interrogatories, then we will consider allowing oral

22 discovery. But I think under the circumstances that we

23 have the balance of this week, and here we are. If Miss

24 Weiss is the one who has charge of that witness, it

25 seems to me that we should hear from Miss Weiss in order

1 that we have a clear picture on what the situation is.

2 When were the interrogatories filed?

3 MR. SOHINKI: They were -- I believe they were

4 hand-served on June 16. It was 14 days before July 1.

5 They were hand-delivered on that day, which would have

6 made them due 14 days later.

7 My point with regard to having a basis for the

8 contentions when they filed it Mr. Chairman, is simple.

9 JUDGE CARTER: I understand it perfectly. You

10 don't have to argue it. I understand it, but I'm not

11 going to get into the background as to how it was

12 formulated or why, because that would be a case in

13 itself.

14 The point before us is when are the

15 interrogatories going to be answered. Mr. Blum, will

16 you convey to Miss Weiss this discussion we have had and

17 tell that I want an answer on Monday as to when the

18 interrogatories are going to be filed?

19 MR. BLUM: Yes, sir.

20 MR. SOHINKI: Mr. Chairman, I don't see why it

21 is not appropriate at this time, UCS having had these

22 interrogatories for several weeks now, for the Board not

23 to issue an order that they be provided.

24 JUDGE CARTER: I have issued an order. I told

25 Mr. Blum to call me on Monday and let me know why the

1 answers were not filed and when they will be filed, and
2 I don't holding her in contempt of court would really
3 move the ball forward one bit, and I am sure you will
4 read in ALAB 678 that I will be reversed by the Appeal
5 Board anyhow.
6 So I want to be sure that the matter is
7 disposed of as promptly as possible.
8 MR. SOHINKI: I wasn't suggesting that you
9 hold her in contempt, Mr. Chairman. All I was
10 suggesting is they should not have to consult an expert
11 to tell us what the basis for the contention was when
12 they filed it.
13 JUDGE CARTER: Your point was not lost to me.
14 I understand the point.
15 Mr. Levin?
16 MR. LEVIN: Your Honor, if I might make one
17 point -- and I assure you I am not going to recite
18 conversations between myself and anyone -- I think this
19 whole problem can be resolved by an NRC case in re
20 Offshore Power Systems. I think this will be
21 instructive for everybody from here on out, even if it
22 does nothing to clear out what is going on.
23 JUDGE CARTER: Mr. Levin, let me save some
24 time. I am familiar with the law on the subject. I
25 have advised Mr. Blum to have Miss Weiss call me on

1 Monday and then, if necessary, I will issue an order. I
2 am as anxious as anyone is to have answers to
3 interrogatories filed.
4 However, to the extent that an interrogatory
5 may require research on the part of any party or witness
6 that is improper, and we will not require them to do
7 that. I want to see that the answer gets filed. I want
8 Dr. Beyea's cross examination completed today and unless
9 it is something really urgent that cannot wait, I would
10 like to proceed.
11 MR. LEVIN: Let me get the cite and I would
12 just refer the Board and the parties to in re Offshore
13 Power Systems, 2 NRC 813, particularly at page 815, with
14 respect to the duties of parties in responding to
15 documents.
16 JUDGE CARTER: Miss Moore, are you ready now
17 to continue your examination of Dr. Beyea?
18 MS. MOORE: Yes, Mr. Chairman.
19 Whereupon,
20 JOHN BEYEA
21 and
22 BRIAN PALENIK,
23 the witnesses on the stand at the time of recess, having
24 been previously duly sworn, resumed the stand and were
25 further examined and testified as follows:

1 WITNESS BEYEA: May I say that during the
2 break I found the answers to the questions that you
3 asked and, if you would like, I could begin with those
4 questions now.
5 CROSS EXAMINATION - Resumed
6 BY MS. MOORE:
7 Q That is what I was going to ask you to do.
8 JUDGE CARTER: It might help us if you could
9 repeat the questions.
10 MS. MOORE: Certainly.
11 BY MS. MOORE: (resuming)
12 Q Dr. Beyea, with regard to a PWR-1 release, I
13 had asked you if you would be able to find any
14 calculations in WASH-1400 which would point to the more
15 serious nature of that accident.
16 A (WITNESS BEYEA) Yes. As I mentioned first,
17 there was a question of the ruthenium release, but
18 perhaps more important is the question of the plume rise
19 following the accident. And I, during the break, looked
20 up Volume 6, page 1332, and found some curves which
21 refresh my memory.
22 They show two release categories for PWR-1
23 release -- categories PWR-1A and PWR-1B. PWR-1A is a
24 relatively -- the difference between a PWR-1A and -1B is
25 simply in the amount of energy which is released from

1 the containment.

2 And on Table 6- -- I'm sorry, Table 62-1, it

3 is footnote E, indicates that accident sequences within

4 PWR-1 category have two distinct energy releases that

5 affect consequences. PWR-1 category is subdivided into

6 PWR-1A, with a probability of 4 times 10^{-7} per reactor

7 year, and 20 million BTU per hour release, and PWR-1B,

8 with a probability of 5 times 10^{-7} per reactor year

9 and 520 million BTU per hour.

10 So now that I recall, it is the low release

11 height scenario, or PWR-1A, which makes the PWR-1 a more

12 serious release for early consequences.

13 Q Dr. Beyea, are you familiar with a document

14 entitled "Overview of the Reactor Safety Study

15 Consequence Model, NUREG-0340?"

16 A (WITNESS BEYEA) Yes, I am.

17 Q In that document -- do you have a copy of that

18 document with you?

19 A (WITNESS BEYEA) No, I do not.

20 Q In that document, on page 38, there is a

21 table, numbered Table 10, and I have a copy of that

22 document.

23 (Witness furnished with document.)

24 JUDGE CARTER: Would you like this identified

25 for the record, Miss Moore? All right, we will identify

1 this as Staff -- as S-2 and what is the source of this
2 document, Miss Moore?
3 (The document referred to
4 was marked Staff Exhibit
5 2 for identification.)
6 MS. MOORE: The source is a document entitled
7 "Overview of the Reactor Safety Study Consequence Model,
8 NUREG-0340."
9 JUDGE CARTER: This is page 38, Table 10,
10 titled "Consequence of Individual Release Categories."
11 Proceed.
12 BY MS. MOORE: (resuming)
13 Q This Table, Dr. Beyea, shows the consequences
14 that the Reactor Safety Study arrived at for various
15 release category accidents.
16 A (WITNESS BEYEA) I would like to clarify
17 that. It does not appear to show the consequences. It
18 appears to show consequences times probability.
19 Q I will draw your attention to that portion of
20 the Table which identifies consequences at 10^{-9}
21 value.
22 JUDGE PARIS: Did you say 10^{-9} ?
23 MS. MOORE: Yes. It is the three columns on
24 the righthand side of the table.
25 JUDGE PARIS: Oh, I'm sorry.

1 WITNESS BEYEA: That does give some
2 consequence information.
3 BY MS. MOORE: (resuming)
4 Q I would ask you this: In terms of early
5 fatalities, are the consequences listed in that table
6 for a PWR-1 release greater or less than for a PWR-2
7 release?
8 A (WITNESS BEYEA) I think that is very
9 misleading. The different categories have different
10 probabilities in this study. This is -- what you are
11 saying here is according to the Reactor Safety Study the
12 probability of early fatalities at some level is
13 actually slightly greater for a PWR-2 than for a PWR-1.
14 On the other hand, if you did a different
15 calculation and said, given a release what is the
16 probability of an early fatality level, then it would go
17 the other way. So I think that this document does not
18 in any way support the statement that the consequences
19 from a PWR-2 are worse than a PWR-1.
20 Q Have you done such calculations?
21 A (WITNESS BEYEA) That is a semantic problem.
22 Q Have you done such calculations?
23 A (WITNESS BEYEA) Yes, I have.
24 JUDGE PARIS: In other words, you disagree
25 with the probability values given in this table?

1 WITNESS BEYEA: Well, I happen to, but that is
2 not the point here.
3 JUDGE PARIS: But you do. Okay. What is the
4 point here?
5 WITNESS BEYEA: The point is that they have
6 weighted -- well, it is a semantic problem. It is a
7 question of semantics. I mean in my statement that I
8 thought that if I had used -- I said a PWR-1 is more
9 serious, and by that I mean if I had used a PWR-1A
10 release, or whichever one it is in my testimony, I would
11 have come up with more serious consequences, and that is
12 how the statement in my testimony should be evaluated.
13 It is true that if the PWR-1 release has a
14 significantly lower probability than the PWR-2, then at
15 a certain probability level the consequences from a
16 PWR-1 could be less serious.
17 JUDGE SHON: I think, Doctor, the point is
18 this. Let me see if I understand it, and I will explain
19 what I as a member of the Board hear you and Ms. Moore
20 saying. The numbers entered under "risk" in this chart
21 are in actuality of the major of a product of
22 probability and consequences.
23 If one wants consequences alone, one must
24 divide by a probability in order to reconvert. The
25 things listed under 10^{-9} -- early fatalities, latent

1 fatalities and so on -- are generated by dividing the
2 risk numbers by the arbitrary 10^{-9} probability.
3 This probability is not the same for PWRs 1
4 and 2 necessarily. And indeed if one divides the
5 figures given in the table for early fatalities and
6 latent fatalities under risk, by the corresponding
7 probabilities for PWR-1 and 2, one would get larger
8 consequences for the 1 than for the 2. Is that right?
9 WITNESS BEYEA: That is what I am saying, yes.
10 JUDGE SHON: Well, that seems to make sort of
11 sense to me.
12 BY MS. MOORE: (resuming)
13 Q We had another question pending. I believe it
14 was whether you were able to find a description of
15 minimal treatment in the Reactor Safety Study.
16 A (WITNESS BEYEA) Yes. It is actually the
17 continuation of the quotation that I listed on my table,
18 and I would like to read, then, from Appendix 6,
19 Appendix F of that Appendix 6 -- F-1. After the
20 definition of "supportive treatment," which I read, it
21 says: "The term 'minimal treatment' indicates the
22 absence of any of these measures."
23 Q Thank you for that, by the way. Do you know
24 the basis for the minimal treatment curve in the Reactor
25 Safety Study?

1 A (WITNESS BEYEA) It is discussed in the same
2 appendix which I mentioned, and that is the extent of my
3 knowledge.
4 Q Could you tell me what you know about of the
5 basis for that curve? Or are you saying you know it is
6 discussed there? I wasn't quite sure of your answer.
7 A (WITNESS BEYEA) Well, in Section F 1-2-1,
8 minimal treatment is discussed and I don't think I can
9 add anything to what is written in that section, and my
10 knowledge comes from reading that section.
11 Q Well, then, could you tell me what your basis
12 was for shifting that minimal curve down 25 rem?
13 A (WITNESS BEYEA) Yes. I mentioned that
14 yesterday and I will repeat that. The LD value of 350
15 used in the Reactor Safety Study is a shift from
16 previous practice in the radiological health community.
17 The previous number that was used was 300 rads, so that
18 the Reactor Safety Study essentially said that radiation
19 is probably not as dangerous in an early death sense as
20 previously considered in the health physics community.
21 Other countries that I have visited and
22 prepared studies for did not accept the 350 LD-50 and so
23 I was faced with the fact that there was a disagreement
24 once again in an opinion as to what is the correct
25 value, and so I took a mid-range value of 325 rads.

1 I must point out that I fail to see the
2 relevance of that since, as far as I can tell, it has
3 very little impact on our testimony.
4 Q Okay, fine. Thank you.
5 In your testimony you, on Table 2, I believe
6 it is, you cite a value of 65 for the Reactor Safety
7 Study as the value for calculating latent cancer
8 fatalities, is that right?
9 A (WITNESS BEYEA) That is correct.
10 Q Could you tell me how that value of 65 was
11 derived?
12 A (WITNESS BEYEA) Once again, I took it out of
13 various sections of WASH-1400 and I'm embarrassed to say
14 that the footnote does not indicate exactly where it
15 comes from. It comes from -- as I recall now, there is
16 a table that shows -- well, it shows a variety of values
17 they use for different dose ranges, from 24 to 122. And
18 I believe in that text there is a statement that the net
19 impact is a reduction of about a factor of two, so
20 again, I could, if necessary, look through WASH-1400 at
21 this time to find that.
22 On the other hand, the number may have come
23 from discussions with various members of the Staff who
24 did the Reactor Safety Study Appendix 6.
25 Q Okay, thank you.

1 MS. MOORE: Your Honor, I have some questions
2 concerning a letter that Dr. Beyea mentioned and was
3 kind enough to provide to us this morning. Those are my
4 only remaining questions and I don't know whether you
5 want me to ask my questions now or wait until it comes
6 up again at some point.
7 JUDGE CARTER: It's up to you, Miss Moore.
8 You can proceed if you like.
9 MS. MOORE: Then I would just ask two
10 questions.
11 BY MS. MOORE: (resuming)
12 Q Could you tell us, Dr. Beyea, again the date
13 of that letter that you provided this morning?
14 JUDGE CARTER: Is there a copy? Do you want
15 this identified?
16 MR. LEVIN: Your Honor, we had planned to
17 raise this issue once cross examination was finished by
18 Staff. We have copies we made this morning for everyone
19 and we could have those marked now for identification
20 and distributed.
21 JUDGE CARTER: Do you have any preference for
22 how you want it marked -- as Staff or --
23 MR. LEVIN: It should be PA Exhibit 7.
24 JUDGE CARTER: Let's identify it for the
25 record. Mr. Levin, would you identify it for the record?

1 MR. LEVIN: Yes, sir. This is a document
2 dated October 7, 1979, directed to Mr. James J.
3 MacKenzie, Senior Staff Member for Energy, from William
4 A. Mills, Acting Deputy Assistant Administrator for
5 Radiation Programs on the letterhead of the U.S.
6 Environmental Protection Agency.
7 Let the record reflect that I am handing
8 copies to the court reporter and Board and the parties.
9 (The document referred to
10 was marked PA Exhibit 7
11 for identification.)
12 JUDGE CARTER: We all have that now, Miss
13 Moore, if you want to ask your question.
14 BY MS. MOORE: (resuming)
15 Q Dr. Beyea, could you tell us the date of that
16 letter?
17 A (WITNESS BEYEA) I believe the letter says
18 October 2, 1979, however, it is not clear whose date
19 that is. It is a stamped date.
20 Q Thank you. Therefore, this letter was
21 received by you, as I understand it, before the issuance
22 of the 1980 Beir Report, is that correct?
23 A (WITNESS BEYEA) Yes, that is correct.
24 MS. MOORE: Thank you. I have no other
25 questions.

1 JUDGE CARTER: Is there any redirect?

2 MR. COLARULLI: Mr. Chairman, we have, per

3 your direction, reserved our cross examination on the

4 letter until this time. Can be conduct that?

5 JUDGE CARTER: I think that would be better.

6 CROSS EXAMINATION - Resumed

7 BY MR. COLARULLI:

8 Q Dr. Beyea, turning again to the exhibit which

9 has been identified as PA Number 7, just for the record,

10 so the record is complete, is this the document that you

11 did provide to the Licensees and which is indirectly

12 referenced in your prefiled testimony?

13 A (WITNESS BEYEA) Yes, it is.

14 MR. COLARULLI: Your Honor, at this time, I

15 would move that the document be received into evidence.

16 We moving that is be put in evidence not for the truth

17 of the matter but as an accurate representation of the

18 source of the statements relied upon by Dr. Beyea in his

19 prefiled testimony.

20 JUDGE CARTER: Well, thus far we have not,

21 other than the statements of testimony, received

22 anything into evidence. If you would hold that and we

23 will move all of the individual exhibits in at one

24 time. So far I think the FEMA response was admitted.

25 That was PA-1 on July 8. There is no reason why we

1 can't do it now.

2 MR. COLARULLI: Mr. Chairman, the letter is

3 relied upon directly in the text on page 19 of the

4 prefiled testimony on lines 7 through 10.

5 JUDGE CARTER: Give us the citation again.

6 MR. COLARULLI: Page 19 of Dr. Beyea's

7 prefiled testimony, lines 7 through 10.

8 MR. BIALIK: Mr. Chairman, we have no

9 objection to the admission of this document.

10 JUDGE CARTER: All right, PA-7 is admitted

11 into evidence.

12 (The document previously

13 marked PA Exhibit 7 for

14 identification was

15 received in evidence.)

16 BY MR. COLARULLI: (Resuming)

17 Q Dr. Beyea, turning to page 17 of your prefiled

18 testimony, again just to get back on the record a couple

19 of key facts that were covered yesterday, looking at

20 footnote number 1 on that page --

21 A (WITNESS BEYEA) Yes.

22 Q Is it your statement that you are not an

23 expert witness on the effects of radiation?

24 A (WITNESS BEYEA) That is correct.

25 MR. BIALIK: Objection. Now we are going

1 beyond the one document as to which cross examination
2 was --
3 JUDGE CARTER: I'll permit the question.
4 BY MR. COLARULLI: (Resuming)
5 Q And is it also your testimony that in this
6 section of your report you have surveyed the literature
7 and rely upon that survey for your conclusions since you
8 are not an expert?
9 A (WITNESS BEYEA) That is correct.
10 Q Dr. Beyea, is this letter from a Dr. Mills to
11 a Mr. MacKenzie a published document?
12 A (WITNESS BEYEA) It was made available to any
13 parties who requested it. It was so stated in my final
14 report that copies of all material received upon reviews
15 of the draft were available to the public from the
16 Council on Environmental Quality or through me.
17 MR. COLARULLI: Your Honor, I move to strike
18 the answer as non-responsive to the question.
19 MR. BIALIK: Objection. I think it is very
20 responsive. It is a published document that is
21 available to the public.
22 MR. COLARULLI: Mr. Chairman, that hardly
23 constitutes being public. I renew my motion to have
24 this stuck because it is not a published document of the
25 Environmental Protection Agency.

1 WITNESS BEYEA: Well, I think you might define
2 what you mean by "published." What do you mean by
3 "published?"
4 MR. COLARULLI: Is this a document which the
5 Environmental Protection Agency has published to the
6 public, has released to the public as its official
7 position?
8 MR. BIALIK: Objection. This document which
9 has been introduced into evidence by the Port Authority
10 speaks for itself as a document from the Environmental
11 Protection Agency to another branch of the Federal
12 government. It is clearly a public document. Whether
13 or not it was published in book form is a separate
14 question and if the witness knows that, if that is what
15 he means, he can tell you that it is a public document.
16 MR. COLARULLI: Mr. Chairman, the facts are to
17 the opposite of what Mr. Bialik has just mentioned. The
18 first page of this letter makes clear --
19 JUDGE CARTER: You moved to put the document
20 into evidence. There was no objection. Now what is the
21 purpose of the question? It seems to me it is a public
22 record under the Rules of Evidence. It is within the
23 area of the activities of the Environmental Protection
24 Agency and it is something on which they have a duty to
25 report. It is a public record.

1 Why do we have to argue any more about it?

2 MR. COLARULLI: Your Honor, we moved it into

3 evidence for a limited purpose only, and that purpose

4 was to establish it as an accurate representation of

5 what Dr. Beyea has relied on in his testimony. Now this

6 reliance on a fact which we are going to get into

7 momentarily is a critical basis for all of Dr. Beyea's

8 facts throughout this study, and we are now trying to

9 establish exactly what weight should be given this

10 document.

11 JUDGE CARTER: Well, the nature of the

12 document is not, I think, its weight. I think it is a

13 public record.

14 MR. LEVIN: Your Honor, if I might, it may

15 well be a document that is subject to inspection by the

16 public, but that would not make it the kind of published

17 document upon which experts in the field generally

18 rely. As I said yesterday to the Board, our intention

19 here, after eliciting certain responses from the

20 witness, will be to make a motion to strike the

21 testimony entailed in the witness' filed testimony with

22 the Board on the basis that he has no basis of any other

23 expert in order to come to that conclusion, that it is

24 simply a conclusionary statement and that he has used a

25 letter, not even a letter subscribed to by the writer,

1 but a letter that says this is the opinion of some
2 unnamed staff members of the EPA in a minor paragraph --
3 paragraph 12, to be exact -- of this letter, and that
4 simply is not sufficient support for a non-expert in the
5 area of health matters to take that and bootstrap
6 himself into using that opinion.
7 That is where we are going.
8 JUDGE CARTER: You made your point.
9 JUDGE PARIS: It appears to me, Mr. Levin,
10 that the cover letter indicates that the comments found
11 in the enclosure represent the opinion of the Office of
12 Radiation Program of the Environmental Protection Agency.
13 MR. LEVIN: Of unnamed staff members, that is
14 correct, Your Honor. However, there are certain facts
15 relative to this letter which, number one, would suggest
16 that they were relying on the 1972 Beir Report in making
17 this assessment and they made no independent assessment
18 of the witness' assertion with respect to the matters
19 discussed in paragraph 12 of the letter.
20 JUDGE CARTER: I hear you saying, Mr. Levin,
21 that the document, though a public letter by a Federal
22 agency, is not expertly done. Now I don't think that is
23 the test.
24 JUDGE PARIS: Federal agencies publish some
25 documents which are in the public record, and some they

1 do not publish which are on the public record. There
2 are decisions in the Atomic Safety and Licensing Board
3 panels which are not published but are on the public
4 record that still have the effect of whatever effect
5 they normally have. And the same is true for the Appeal
6 Board.
7 MR. LEVIN: Yes, sir, but if you refer to page
8 19 of the witness' testimony, at line 9, you see a
9 range, and I quote, "a range which the Environmental
10 Protection Agency has agreed is reasonable." The
11 witness has thereby implied that this letter and the
12 attached comments to the letter support his position,
13 which he has no independent right to make. He has to
14 get it from the literature, from some expert assertion.
15 If you go to paragraph 12, it asserts that is
16 his reason. That simply is not what paragraph 12 of
17 that letter does, and that is where this cross
18 examination was going. It is not the point that some
19 expert may not subscribe to this. The point is that it
20 is not the kind of document that is sufficiently
21 authenticated for purposes of one expert to rely upon in
22 his testimony where he is not expert in that field.
23 JUDGE PARIS: I will agree the witness'
24 statement on page 19, line 9 may seem to imply that what
25 is in this letter represents the official policy of the

1 Environmental Protection Agency, and perhaps that is not
2 true.
3 JUDGE CARTER: I think you made your point,
4 Mr. Levin. We see what it is based on, to look at it
5 and make a determination. The witness has said this is
6 what he relied on, and it is not merely a piece of paper
7 that some declarant provided for him who is not subject
8 to cross examination or something like that. It is a
9 public record and we will give it whatever weight we
10 think it is worth.
11 MR. LEVIN: All right, sir. I think Mr.
12 Colarulli does have some additional questions on cross
13 with respect to that.
14 BY MR. COLARULLI: (Resuming)
15 Q Dr. Beyea, would you turn to page 19 of your
16 testimony?
17 A (WITNESS BEYEA) Yes.
18 Q And could you just read us, sir, the complete
19 sentences in the record, the sentence beginning on line
20 7, "For instance?"
21 A (WITNESS BEYEA) May I read beginning on line
22 4?
23 Q Lines 7 through 10.
24 MR. BIALIK: Can I object to that? The
25 witness thinks he has to start a few lines earlier to

1 put it in context.

2 MR. COLARULLI: Mr. Chairman, if they choose

3 to go in some other direction on their redirect, they

4 are free to do that. I have a question pending. Would

5 the witness please read the sentence beginning on line 7

6 and ending on line 10?

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1 JUDGE CARTER: On page 19 -- all right. Go
2 ahead, you may read it.
3 WITNESS BEYEA: Line 7?
4 JUDGE CARTER: Yes.
5 WITNESS BEYEA: "For instance, based on our
6 review of the literature, we have used a coefficient
7 range of 50 to 500 cancer deaths (non-thyroid) per
8 million person rem to the whole body, a range which the
9 Environmental Protection Agency has agreed is
10 reasonable."
11 BY MR. COLARULLI: (Resuming)
12 Q Dr. Beyea, would you turn to Exhibit 7, the
13 second page of the attachment, paragraph 12? And would
14 you please read paragraph 12?
15 A (WITNESS BEYEA) "The estimated risk from
16 total body exposure at 50 to 500 fatalities per million
17 person rem appears reasonable. The 1972 Beir Report
18 yields 94 to 460. Reference to their 1972 report as
19 support for the 50 to 500 choice could be considered."
20 Q Dr. Beyea, is there any other support in this
21 exhibit for your statement on page 19 of your prefiled
22 testimony, lines 7 through 10?
23 A (WITNESS BEYEA) No, there is not.
24 Q Dr. Beyea, do you know whether Dr. Mills, the
25 author of the covering letter of this document, is still

1 with the EPA?

2 A (WITNESS BEYEA) I do not know.

3 Q Do you know whether Mr. MacKenzie is still

4 with the Council on Environmental Quality?

5 A (WITNESS BEYEA) No, he is not. I don't think

6 there is a Council on Environmental Quality any more.

7 Q Do you know what position Mr. MacKenzie has?

8 A (WITNESS BEYEA) Mr. MacKenzie now works for

9 the Union of Concerned Scientists.

10 MR. COLARULLI: Your Honor, at this time we

11 would like to move to strike the references to the

12 Environmental Protection Agency having agreed that the

13 50 to 500 dose health effects coefficient is

14 reasonable. That passage is page 19, lines 7 through 10

15 of the prefiled testimony.

16 And further move to strike all of the

17 consequence calculations that are based upon that range

18 of health coefficients.

19 MR. BLUM: Your Honor --

20 MR. COLARULLI: Your Honor, the only document

21 upon which Dr. Beyea has relied in his survey of the

22 literature is this document, PA Number 7. We believe

23 that provides absolutely no support for his position.

24 It is clear that the authors of this letter are merely

25 the staff of one office within EPA and they do not

1 represent the official position of the Environmental
2 Protection Agency.
3 Dr. Beyea has made an expert judgment in an
4 area which he admits is not his expertise. He relies
5 upon no current source in the literature. He has
6 attempted to bootstrap his own reliance on an earlier
7 1972 Beir Report which has been superceded by the 1980
8 Beir Report.
9 And, finally, Dr. Beyea is in no way competent
10 to present his own calculation of the 50 to 500 health
11 dose effect coefficient.
12 MR. BRANDENBURG: Con Edison joins in that
13 motion, Mr. Chairman, and I would like to emphasize for
14 the Board the fact that the footprints for this
15 reference, if you would, do indeed lead to the 1972 Beir
16 Report and as the -- as Dr. Beyea's testimony itself
17 indicates, on page 20, that has been superceded by the
18 1980 Beir Report.
19 So I think for that reason standing alone,
20 independent of the sufficiency of this Exhibit PA-7, the
21 references are unsupported in the literature and in the
22 absence of Dr. Beyea's own personal expertise it must be
23 stricken.
24 MR. BLUM: Your Honor, this characterization
25 of total reliance on this one letter is totally false.

1 We had planned to go into this on redirect. It is part
2 of the Table 2. It is apparent on Table 2 that Dr.
3 Beyea has relied on other literature we were going to
4 bring it out more fully on redirect.
5 But this is an extremely unfair way of
6 characterizing things.
7 JUDGE CARTER: Mr. Bialik?
8 MR. BIALIK: Your Honor, apart from that, if
9 the Office of Radiation Programs of EPA, the office that
10 presumably deals with radiation, takes this position,
11 the fact that some other office might not is relevant on
12 the face of it.
13 I think we have what appears to be a
14 presumptive case that this is the position of USEPA.
15 Now if the authority here wishes to go beyond the face
16 of this document and produce witnesses from EPA to
17 testify that they send out letters routinely not
18 concerning anyone's opinion and if that is relevant --
19 well, what we have here is a presumptive, invalid
20 document that they themselves put in evidence that very
21 clearly supports Dr. Beyea's position here.
22 Beyond that, they may interepret this document
23 to say that the only basis that EPA has which relies is
24 the 1972 Beir Report. It does not say that. And you as
25 the judges can interpret it to mean exactly what it does

1 say. They think it is reasonable and apart from the
2 fact that they think the number is reasonable there is
3 the Beir Report in addition.
4 Finally, I would agree with Mr. Blum that the
5 conclusion drawn by the Power Authority that Dr. Beyea
6 has no authority in the literature except this document
7 is not supported by the testimony he gave yesterday.
8 JUDGE CARTER: The decision of the Board is
9 the motion to strike is denied. Do you have anything
10 further, Mr. Colarulli?
11 MR. COLARULLI: I do not. Mr. Levin does.
12 MR. LEVIN: Your Honor, I might, just because
13 it has been stated on a couple of occasions by counsel,
14 once again, this document is offered not for the truth
15 that is inferred. It is offered not for the truth of
16 any of the statements in here but only for the purpose
17 of demonstrating that this is the document upon which
18 the witness relied.
19 MR. BLUM: Your Honor, based on the fact that
20 this has been identified as a public record, we might
21 like to have the -- we would like to move that the Board
22 clarify that it has been received for all purposes.
23 JUDGE CARTER: The document is in evidence.
24 It was moved without objection. It was moved. There
25 was no objection. It is in the record. We will give it

1 whatever weight the Board feels we should give it.

2 Subsequent to the motion and the admission,

3 there was a motion to limit its impact. I see no reason

4 to change the order.

5 MR. HASSLE: As I recall, Your Honor, the

6 motion moving it into evidence was not for the purpose

7 of demonstrating the truth of the matters asserted in

8 the document. It was clearly limited by the statement

9 that Licensees' counsel made, and I recall that being a

10 part of the motion, and that was not objected to.

11 JUDGE CARTER: It is convenient to speak of a

12 document not being admitted for the truth of the

13 contents, but the duty is now on the proponent under

14 these circumstances to prove the admissibility of those

15 statements. The document, as a public document or as a

16 learned treatise, if there were the case, would go in as

17 such. We need not approve the ingredients of every

18 record.

19 MR. BRANDENBURG: In light of your recent

20 ruling, I would like to object to the Power Authority's

21 ruling.

22 MR. LEVIN: Your Honor, we do not offer it for

23 the truth of anything in there. If somebody wants to

24 offer it for the truth of what is in there, then we

25 would at least object on the basis of hearsay at least.

1 MR. COLARULLI: Mr. Chairman, I believe the
2 record will clearly show that when I moved for the
3 document to be entered into evidence it was for a
4 limited purpose only, and that is the motion that I
5 believe you granted.
6 JUDGE CARTER: The document is in the record
7 for whatever use the Board will make of it. It is not
8 introduced on the grounds -- it is not accepted on the
9 grounds that the EPA is correct or wrong. It is only
10 introduced because that is what the EPA unit, group, or
11 persons said.
12 MR. COLARULLI: Thank you, Your Honor.
13 (Board conferring.)
14 JUDGE CARTER: Do you have anything more?
15 MR. COLARULLI: We are making a shambles of
16 our time limitations.
17 JUDGE CARTER: Anything more?
18 MR. COLARULLI: At this time my cross
19 examination is concluded.
20 JUDGE CARTER: Mr. Blum, are you going to
21 conduct the redirect?
22 MR. BLUM: Yes, Your Honor.
23 JUDGE CARTER: All right. Proceed.
24 REDIRECT EXAMINATION
25 BY MR. BLUM:

1 Q Dr. Beyea, with regard to the Environmental
2 Protection Agency document here labeled as Power
3 Authority 7, could you apprise us of how critical the
4 information contained in this document is for supporting
5 your testimony?
6 A (WITNESS BEYEA) I do not think it is critical
7 at all. First of all, if one used the BEIR Report
8 itself, the 1980 BEIR Report, completely, it would have,
9 at most, a factor of two change in the total cancer
10 fatalities that were given, which I do not consider to
11 change the substance or thrust of my report.
12 JUDGE CARTER: What do you mean "a factor of
13 two?"
14 WITNESS BEYEA: Well, in other words, suppose
15 one used the number range 50 to 226, instead of finding
16 6,000 to 50,000 latent cancers from one direction, one
17 would find 6,000 to 25,000. So we are talking here
18 about that extra 25,000.
19 Secondly, I would like to go back and read the
20 lines I was not allowed to read previously that set the
21 context for that statement, which is on lines 4, 5, and
22 6. No, line 4, beginning "since experts disagree on the
23 exactly magnitude of the dose effects relationship for
24 these injuries, we have used a range of coefficients in
25 our calculations broad enough to encompass most expert

1 opinions."

2 And, as I mentioned yesterday, one minority

3 report in the 1980 BEIR Report does include a number

4 which is quite close to 500, the number we have used.

5 So that I do not think the letter, the EPA letter, is at

6 all critical to my testimony.

7 JUDGE CARTER: Did you consider that as one of

8 the expert opinions you examined?

9 WITNESS BEYEA: Yes. It is clearly stated in

10 the 1980 BEIR Report. The minority report is given

11 clearly in that report, and there also have been

12 numerous discussions of the 1980 BEIR Report in the

13 magazine Science and in other magazines.

14 BY MR. BLUM: (Resuming)

15 Q Dr. Beyea, in your modeling of a PWR-2 release

16 you used the figure 70 percent of iodines would be the

17 radioactive iodines which would be released. Could you

18 explain why you chose this figure?

19 A (WITNESS BEYEA) Well, I chose it because it

20 was the only -- well, it was part of the only consistent

21 set of release fractions that was available to me. The

22 report that I quoted in my study, in our study, which

23 mentioned up to 50 percent did not give an alternate

24 complete set of release fractions of tellurium or cesium

25 or strontium. If they had, I would have used the

1 consistent set that they came up with.

2 As a witness, it seemed to me that I had to

3 use a consistent set of numbers and so I used the

4 numbers that are given in the Reactor Safety Study.

5 I would like to note that in the Indian Point

6 probabilistic risk assessment the same 70 percent

7 release of iodine is used for the equivalent category

8 and I would like to reference that.

9 Q Could you identify it more specifically?

10 A (WITNESS BEYEA) This is Table 6.2-17 from the

11 Indian Point probabilistic risk assessment and for the

12 categories 2 and Z-1 a .7 or 70 percent release of

13 iodine was used.

14 I would like to amplify that. In other words,

15 it is possible that in the new work that the iodine

16 might drop, but the tellurium might go up. And,

17 therefore, the net impact could be quite consistent.

18 Q Dr. Beyea, under cross examination in your

19 discussion of the LD-50 values, was there a source that

20 you were relying upon that you were not able to bring

21 out under cross examination?

22 A (WITNESS BEYEA) There is a reference to the

23 sources that I relied on and I made that copy

24 available -- a copy of that paper available to Con

25 Edison and PASNY the other day.

1 Q Well, could you identify the paper that you
2 are talking about?
3 A (WITNESS BEYEA) There is a paper entitled
4 "International Standard Problem for Consequence
5 Modeling: Results," page 778 of the Proceedings of the
6 International ANS/ENS Topical Meeting on Probabilistic
7 Risk Assessment, and on page 782 is a discussion of the
8 results of the benchmark study which I relied on, and I
9 would like to quote two sentences from that, if I may.
10 Q Could you pause for one minute for the Board
11 to get its copies of the document?
12 JUDGE CARTER: Do you want this document
13 identified?
14 Your next number would be number 3 -- UCS-3.
15 MR. BLUM: It should be marked UCS-3.
16 JUDGE CARTER: Would you identify the
17 document? For the record, would you identify what the
18 document is?
19 MR. BLUM: Okay. The document is on the front
20 page labeled "Proceedings of the International ANS/ENS
21 Topical Meeting on Probablistic Risk Assessment,
22 conducted in Port Chester, New York, September 20-24,
23 1981, sponsored by the American Nuclear Society and the
24 European Nuclear Society." And it consists of a paper
25 entitled "International Standard Problem for Consequence

1 Modeling: Results," and lists about 15 different
2 authors, beginning with D. C. Aldrich and D. J. Alpert
3 of Sandia National Laboratories, USA, and it is on pages
4 778 through 787 of these proceedings.
5 And the page from which Dr. Beyea will be
6 reading is on page 782 in the paragraph just under
7 "health effects."
8 (The document referred to
9 was marked UCS Exhibit 3
10 for identification.)
11 BY MR. BLUM: (Resuming)
12 Q You can go ahead now.
13 A (WITNESS BEYEA) This refers to the benchmark
14 participants. "The bone marrow dose mortality
15 relationships used by participants differed
16 significantly. LD-50 values" -- and then it defines
17 it -- "The dose at which the probability of early death
18 is 50 percent varied from about 300 to 510 rad. The
19 variation arises from the statistical imprecision of the
20 available human data and from differing assumptions
21 concerning the extent of medical treatment available
22 following the exposure of a heterogeneous population and
23 the effectiveness of that treatment."
24 MR. BLUM: Your Honor, we move this document
25 be made a part of the record.

1 JUDGE CARTER: Any objection? I hear none.
2 It is admitted.
3 (The document previously
4 marked UCS Exhibit 3 for
5 identification was
6 received in evidence.)
7 JUDGE SHON: Dr. Beyea, I notice this dealt
8 with bone marrow dose mortality relationships. Your
9 calculation was for the whole body, was it not?
10 WITNESS BEYEA: Yes.
11 JUDGE SHON: I would expect some difference
12 between whole body dose and bone marrow dose.
13 WITNESS BEYEA: About twenty percent.
14 JUDGE SHON: So that might shift it another 60
15 rads in the direction of, I think, less.
16 WITNESS BEYEA: Well, the coefficients that
17 are used in my study give you the bone marrow dose and
18 so actually the calculations that I did give bone marrow
19 dose, not whole body dose.
20 JUDGE SHON: I see. I understood it was whole
21 body dose.
22 WITNESS BEYEA: That was an error in my
23 testimony in terms of the statement. Let me just be
24 sure I am right about that. They do. The coefficients
25 I use, which come from Table 6-D-2 of the Reactor Safety

1 Study, Appendix 6, give total marrow.

2 JUDGE PARIS: Give what?

3 WITNESS BEYEA: They give the marrow dose, so

4 the doses we refer to here are not whole body doses.

5 They are marrow doses. However, I point out that there

6 is about a twenty percent difference in the two doses in

7 this case.

8 JUDGE SHON: Your shielding factors of the

9 one-tenth and three-tenths account for this, then.

10 WITNESS BEYEA: No. It has to do with the

11 shielding of the body, that the whole body dose would be

12 slightly higher, I guess, than the bone marrow dose.

13 JUDGE SHON: Yes, it would. I just wondered.

14 You have to start with a source outside the body, either

15 a plain source or a cloud source or something like that,

16 and then calculate bone marrow dose, and in order to do

17 that you have to calculate a shielding factor, and I was

18 just inquiring whether that was included in the

19 one-tenth and three-tenths shielding factor that you had

20 used.

21 WITNESS BEYEA: Let me look again.

22 The numbers that I used for ground dose offer

23 the total marrow dose, and so that is already in there

24 before you put the shielding factor. So that is already

25 in there.

1 JUDGE SHON: It is in there before you account
2 for --
3 WITNESS BEYEA: For the building shielding
4 factor. So it is a self-shielding of the body basically
5 which is already included before I put in the ground
6 shielding factor.
7 JUDGE SHON: And it's already included in
8 matters like radioisotopes deposited in the body and
9 that sort of thing?
10 WITNESS BEYEA: That's also included. There
11 are separate coefficients for material that is inhaled
12 and there are separate coefficients for gamma doses for
13 material deposited on the ground.
14 JUDGE SHON: And the coefficients are all
15 adjusted to your bone marrow dose?
16 WITNESS BEYEA: That is right. And the
17 difference for different isotopes is because of the
18 different energy of the different isotopes.
19 JUDGE SHON: As one would expect. Thank you.
20 BY MR. BLUM: (Resuming)
21 Q Dr. Beyea and Mr. Palenik, earlier it was
22 brought out on cross examination that in your comparison
23 of Parsons-Brinkerhoff evacuation times with times at
24 which early death doses are accrued, you placed or you
25 assumed that people would be in their particular ERPA

1 for the whole evacuation time rather than inside the
2 whole ten-mile EPZ.
3 Could you first explain why you did the
4 modeling this way?
5 A (WITNESS BEYEA) Well, I would first like Mr.
6 Palenik to indicate why we think it was reasonable to do
7 it the way we did it, and then after he does that I
8 would like to go through some of the ERPA tables to show
9 that in any case it is not all that significant. So
10 first I would like Mr. Palenik to indicate several
11 reasons why it is reasonable to do what we did.
12 A (WITNESS PALENIK) We used the evacuation time
13 estimates listed in our tables because, first of all,
14 because Parsons-Brinkerhoff did not itself explicitly
15 model the amount of time that a passenger car equivalent
16 or individuals would remain within their ERPA and we
17 believe that is a reasonable assumption for the last
18 evacuees because, first off, in certain cases there will
19 be -- some evacuees will be waiting for buses to come up
20 and so they could be waiting for almost the full length
21 of time in their ERPA.
22 Secondly, because of congestion problems
23 people could be waiting in their ERPA for a large
24 portion of the evacuation time. Other reasons why we
25 feel this assumption is appropriate is because, first

1 off, as we mentioned yesterday, there is a certain dose
2 received from the car which would say that if even
3 persons left earlier than we have estimated they would
4 receive doses from the car that would tend to compensate
5 for their having left earlier.
6 And also, if the evacuate through the plume,
7 there would similarly be an increased dose in that way.
8 A (WITNESS BEYEA) And I would like to call your
9 attention to Appendices -- a particular Table B-1, which
10 is listed, I guess, at page B-2. It's Table B-1 in the
11 Appendix B.
12 MR. BIALIK: Excuse me. I believe that is in
13 the supplement to the testimony.
14 WITNESS BEYEA: A corrected copy of Table B-1
15 is in the supplementary material. Let's begin with the
16 supplementary Table B-1. I direct your attention --
17 this is Westchester County EPPA 2, by the way, and if we
18 look down under typical weather conditions as opposed to
19 precipitation, we see that under the column "protection
20 of general population" the statement is made that no,
21 the population is not protected from a 200-rem dose.
22 If you assume the highest evacuation --
23 estimated evacuation time of Parsons-Brinkerhoff, what
24 that means is that if the -- if a resident, the last
25 resident obtains a dose for ten hours and fifteen

1 minutes, the so-called dose is received. And if you
2 look down at footnote B, it tells how long it takes for
3 the dose to reach 200 rem. It takes 7.8 hours. And so
4 even if the residents in ERPA 2 left more than two hours
5 before we assumed the 200 rem dose would still be
6 received.
7 If you look down at the precipitation case
8 where we have no protection of the general population,
9 we find that it takes only 1.7 hours before a 200-rem
10 dose can be reached. And yet the Parsons-Brinkerhoff
11 time estimate is something like 12 hours for the last
12 resident to clear the entire ten-mile estimate. So
13 clearly, under that case residents are not going to get
14 out in time no matter what assumption you make about --
15 if you made other assumptions than we did.
16 The same is true if you go to ERPA 3, which is
17 on Table B-2. Here you find that the 200-rem dose is
18 accumulated in 7.3 hours, whereas the time we assume
19 there is an 8-hour, 20-minute evacuation estimate. So
20 even if they left an hour earlier than we assumed, they
21 would still receive a 200-rem dose.
22 In the precipitation case, one finds that the
23 dose is built up in 1.9 hours, and yet the assumption
24 is, the estimate is it would take almost ten hours to
25 get out. So again, clearly there is no chance that one

1 would not reach the dose, no matter what assumptions you
2 make.
3 If we go to ERPA 29, which is Table B-14, here
4 is a case where you do not get protection of the general
5 population and other mid-day conditions with an
6 evacuation time of 11 hours, 45 minutes. The dose
7 reaches 220 rem in 8.2 hours. So again you have several
8 hours leeway here. The rain condition, 1.4 hours before
9 the dose reached 200 rem, an estimate of over ten hours
10 to get out.
11 And I could do the same for ERPA 38 and ERPA
12 39.
13 Q Dr. Beyea and Mr. Palenik, let me ask one
14 additional set of questions to clarify what you just
15 said. Is it your testimony that one of the reasons you
16 modeled it this way rather than attempting to calculate
17 how much time individuals would spend in each ERPA is
18 that the Parsons-Brinkerhoff data made available to you
19 did not contain sufficient information to attempt to
20 model how long individuals would be in each separate
21 ERPA?
22 A (WITNESS BEYEA) That is correct.
23 Q And have you also testified that the way you
24 have modeled here is having individuals inside the one
25 ERPA is a source of non-conservatism that is offset by

1 various additional sources of conservatism in your
2 data -- excess caution, if you will -- and these are the
3 ones Mr. Palenik has mentioned. Is that correct?
4 MR. LEVIN: Your Honor, although it is, of
5 course, permissible to lead witnesses, I think Mr. Blum
6 has gone beyond the pale. Expert witnesses certainly
7 can be led.
8 JUDGE CARTER: I don't mind a little leading
9 once in a while, but I got led astray on that one.
10 Before you go into that, I tried to find -- to
11 follow your calculations and I will let you get back to
12 that in a minute on the tables, but on Table B-14 you
13 made a statement in which I think you mentioned the time
14 of 8.2 hours.
15 WITNESS BEYEA: Yes.
16 JUDGE CARTER: I am unable to make that
17 calculation.
18 WITNESS BEYEA: That is in footnote B, the
19 very last line on that page.
20 JUDGE CARTER: Am I supposed to find that
21 number there?
22 MR. BRANDENBURG: Mr. Chairman, if you have
23 1.9 instead of 8.2, it is because you have the
24 superceded page before you.
25 MR. BLUM: This is in the supplementary part

1 of the testimony.

2 JUDGE CARTER: All right, the 11.9 in the

3 original is changed to 8.2?

4 WITNESS BEYEA: That is correct.

5 JUDGE CARTER: Thank you. Mr. Blum, do you

6 want to proceed?

7 BY MR. BLUM: (Resuming)

8 Q Is the import of Mr. Palenik's testimony that

9 there are additional sources of conservatism that offset

10 the non-conservatism of this modeling procedure?

11 A (WITNESS BEYEA. Well, first of all, we do not

12 say this is a non-conservative modeling technique. That

13 is not the purpose of his testimony. There are

14 certainly conditions in which it would be quite

15 reasonable, but if there were some reason under certain

16 circumstances that it were proved that they would leave

17 somewhat earlier, there would be other effects that we

18 did not include that would compensate for it.

19 Remember, we are talking about the last people

20 to evacuate the ERPA. There are some ERPAs where that

21 may seem to be not as reasonable an assumption as one

22 might make, and in those cases there are other

23 conservatisms that make up.

24 Q With regard to your assumption that any

25 conceivable error introduced by this modeling procedure

1 would not make a great deal of difference, is there a
2 difference in the reasons why this is so for the ERPAs
3 close in to the plant as opposed to the ERPAs near the
4 edge of the ten-mile zone?
5 A (WITNESS BEYEA) Yes. The -- it's quite
6 possible for a close-in ERPA that there is a bottleneck
7 that would keep people from getting far from the
8 original ERPA, whereas in the outer ERPAs, well, then,
9 when you leave the ERPA you are outside the ten-mile
10 zone and then the numbers are exactly coincident with
11 the Parsons-Brinkerhoff numbers.
12 Q Thank you, Dr. Beyea. What difference would
13 it make for your results if the Parsons-Brinkerhoff high
14 and low time estimates turned out to be optimistic?
15 A (WITNESS BEYEA) If that should be shown,
16 then, of course, there would be even less or even more
17 ERPAs and even more weather conditions in which a "no"
18 would appear in the column "Protection of General
19 Population." And the same corollary. That is, people
20 would receive higher doses because they would be
21 spending longer time in contaminated ground.
22 Q During your testimony on cross examination, I
23 believe you stated that for the tables calculating
24 100-rem exposure this included some evacuation through
25 the plume. Is that a correct characterization?

1 A (WITNESS PALENIK) For those calculations we
2 assumed that persons evacuating would receive seven rem
3 per hour after their initial dose, so that for persons
4 beginning their evacuation at around ten miles, that
5 would be about what they would be receiving.
6 But for people within or closer to the plant,
7 they would be receiving a higher rate of radiation dose,
8 so that we used that as a conservative estimate of what
9 they might receive if they were evacuating through the
10 plume. It is not an actual estimate of that.
11 Q Do any of the other tables or calculations in
12 your testimony assume any evacuation through the plume?
13 A (WITNESS BEYEA) No, they do not.
14 Q To what extent, in your opinion, can
15 radioactivity be removed from an automobile by washing
16 the automobile with water?
17 A (WITNESS BEYEA) I think the amount --
18 MR. LEVIN: Objection, Your Honor. I don't
19 think the witness has the competence to answer the
20 question. He has testified he doesn't have that kind of
21 competence, I believe.
22 JUDGE SHON: It is my understanding he
23 testified he was not an expert in decontamination
24 science because he had never heard there was such a
25 science, not that he knew nothing about whether things

1 could be decontaminated. I may be wrong.

2 MR. COLARULLI: Judge Shon, I believe he has

3 also testified that, like other parts of his testimony,

4 his calculations here and his statements are based on a

5 survey of the literature.

6 JUDGE PARIS: He said he surveyed the

7 literature four years ago. Is that right?

8 WITNESS BEYEA: That's right.

9 JUDGE CARTER: You may answer.

10 WITNESS BEYEA: I think the answer I would

11 give is that I don't think one should assume that by

12 hosing down a car that the major part of the

13 radioactivity from an aerosol of one micron of diameter

14 of complex chemical nature would be possible. In other

15 words, I think that with the physics and chemistry of

16 the situation, that it's quite possible that you would

17 have to do more than simply wash off a car to remove

18 most of the radioactivity.

19 JUDGE CARTER: What more would have to be

20 done?

21 JUDGE PARIS: Scrubbing it? You mean with

22 detergent or something like that?

23 WITNESS BEYEA: It is quite conceivable to me

24 that no matter what you did that ten percent of the

25 material will still stay on the car unless you actually

1 scraped the material off of the car.

2 JUDGE CARTER: And on what do you base that?

3 WITNESS BEYEA: Simply on the fact that the

4 traction of one micron sized particle is extremely

5 strong and you cannot remove them unless they dissolve.

6 There is almost a chemical reaction that would take

7 place with a fluid. And all I am trying to caution here

8 is not to make the assumption that by hosing down a car

9 with aerosols on it that you remove the radioactivity.

10 MR. LEVIN: I move to strike the reference to

11 ten percent unless the witness can indicate it has some

12 basis in literature, that he knows it.

13 JUDGE CARTER: I would hope that you figured a

14 Ph.D. in nuclear physics you would know what the

15 properties of the material is.

16 MR. LEVIN: It was not the property of the

17 material that I objected to. It is the assertion there

18 would be ten percent.

19 JUDGE CARTER: It was the property of the

20 material that led to the conclusion.

21 JUDGE PARIS: This whole business comes up

22 because I yesterday suggested you might have to stop and

23 wash your car if you drove through the plume, and I'm

24 sorry I ever mentioned it.

25 BY MR. BLUM: (Resuming)

1 Q Dr. Beyea, is any data available that suggests
2 that the upper bound figure of the 1972 BEIR Report,
3 that is, the figure 621, is itself optimistic?
4 A (WITNESS BEYEA) Well, I would direct you to
5 the footnote on Table 2 in which I do mention the
6 existence of other data.
7 MR. BIALIK: That is on page 20 of the
8 testimony.
9 WITNESS BEYEA: I'm sorry, on page 19, the
10 second footnote on the page. I do call attention to the
11 existence of the work of Mancuso, Stewart and Kneale
12 which indicates that the actual number might be a factor
13 of four or so higher than the 500 that I use. I did
14 not, however, use that in my coefficient range because
15 that is at this point -- there is a lack of confirmation
16 of the Mancuso, Stewart and Kneale data.
17 MR. LEVIN: Your Honor, is there a date on
18 that? I didn't see one. Your Honor, is there a date on
19 that?
20 WITNESS BEYEA: A date on which?
21 MR. LEVIN: A date on the work you just
22 referenced?
23 WITNESS BEYEA: Well, the Mancuso, Stewart and
24 Kneale data has been published. The communication
25 referred to -- I think the material has been published

1 in professional journals, but the personal communication
2 is -- there is no date here.
3 JUDGE SHON: Mancuso, Stewart and Kneale is
4 pretty old stuff by this time. It must be four or five
5 years anyway, isn't it?
6 WITNESS BEYEA: I think actually many official
7 publications are just coming into the literature at this
8 time -- the archival literature. But the communication
9 from Alice Stewart herself was in 1978, in which she
10 told me what the doubling dose was.
11 BY MR. BLUM: (Resuming)
12 Q Dr. Beyea, to what extent is it true that a
13 model such as the one you were using or other experts
14 have used can always be altered by suggesting that if
15 additional complexity were added the results would be
16 lower?
17 MR. BRANDENBURG: I find that question
18 hopelessly confusing, Mr. Chairman.
19 JUDGE CARTER: Try to simplify that. There
20 was one extra, unneeded adjective in there which makes
21 it more difficult.
22 MR. BLUM: Could I ask which the adjective was?
23 JUDGE CARTER: I think it was more
24 complicated, but let's hear the question again.
25 BY MR. BLUM: (Resuming)

1 Q To what extent is it fair to say that the
2 results of a computer model of accident consequences
3 could always be altered to produce lower results by
4 adding some additional factor into the model?
5 JUDGE CARTER: I guess it's the word "always"
6 that bothers me in that question.
7 MR. LEVIN: Not only that, Your Honor, but
8 there is simply no basis in the record for whatever
9 hypothetical Mr. Blum is talking about. I don't see how
10 the answer to that question is going to assist the Board
11 in any way.
12 MR. BRANDENBURG: The hypothetical itself has
13 no frame of reference, Mr. Chairman.
14 MR. BLUM: Shall I try again?
15 JUDGE CARTER: Try again.
16 BY MR. BLUM: (Resuming)
17 Q At a number of points during this proceeding,
18 Dr. Beyea, it was suggested during cross examination
19 that your results could be lowered by introducing some
20 additional complexity into your model. Is that correct?
21 A (WITNESS BEYEA) That was stated in these
22 proceedings and, of course, since a model is a
23 simplification of reality, one can always suggest that
24 you get closer to reality and make the model more
25 complex. And there are certain things you could do. If

1 you did certain things, it would make your numbers come
2 out lower. If you did other things, it would make the
3 numbers come out higher.
4 And it is up to the modeler to do a fair job
5 of not biasing results and picking a mid-range, a model
6 which gives mid-range results.
7 Q To what extent does your study do this, Dr.
8 Beyea?
9 A (WITNESS BEYEA) I think the best example of
10 the fact that the modeling, the final bottom line of the
11 dose numbers is reasonable can be found in the
12 comparison with the results of the benchmark study. It
13 is a factor that the doses that I have calculated with
14 my models come out in the middle of the range of models
15 that are used in other countries, so that it would have
16 been perfectly -- it is perfectly possible that actually
17 the numbers that I am quoting for doses could be two to
18 three times higher.
19 And so I think that it's a -- it is not useful
20 to only look at those aspects of the model which could
21 be made smaller.
22 Q Thank you, Dr. Beyea. We are near conclusion.
23 A (WITNESS BEYEA) Can I amplify that? I'm not
24 quite finished. For instance, discussion was made this
25 morning about the possibility of wind change and how

1 that if the wind meanders in a certain direction you can
2 get a longer path lane and, therefore, lower doses.
3 However, it was not mentioned that of course should the
4 wind shift by 180 degrees people can get double doses.
5 The plume can go down past them and it can turn around
6 the come back and give them twice as high or higher
7 doses.
8 In addition, there are changing weather
9 conditions that can give you very high doses. For
10 instance, if the wind speed suddenly drops over New York
11 City, the deposition increases and you get much higher
12 doses. So I think that there are many -- that any new
13 model will give, in some cases, will give lower results
14 and other cases will give higher results.
15 JUDGE SHON: Dr. Beyea, before we leave the
16 specific point, you say you compared your results
17 against those of the benchmark study conducted and, I
18 guess, reported in this ANS/ENS.
19 WITNESS BEYEA: That is right.
20 JUDGE SHON: You said you were about in the
21 middle. Could you give us a rough idea of how far above
22 and how far below your results people went and in what
23 terms? That is, total cancers or dose rates?
24 WITNESS BEYEA: This was simply dose rate
25 calculation.

1 JUDGE SHON: Dose rate or total dose?

2 WITNESS BEYEA: Well, first of all, it was in

3 the airborne concentration of radioactive materials,

4 number one. I think that was the major comparison that

5 I made. It was in the airborne concentration of

6 material and the amount of material deposited on the

7 ground. So I take it back; it wasn't even a dose as

8 much as it was the physical nature of the calculations.

9 It was the airborne concentration and material deposit

10 on the ground, amount of material left in the plume and

11 so on.

12 JUDGE SHON: And they ranged from how far

13 above yours to how far below yours?

14 WITNESS BEYEA: Well, if you ignore the case

15 where you have an elevated release and just look at the

16 case where you have a ground level release, then the

17 total range can be shown in the document that was

18 entered for evidence.

19 JUDGE SHON: That's UCS-3.

20 WITNESS BEYEA: Yes. And if you look at the

21 very next-to-last page, page 786, and look, for

22 instance, at Figure 4, it shows about an order of

23 magnitude range in the ground concentration.

24

25

1 And when I received these results I naturally
2 looked to see where I was, and I came out in the middle.
3 JUDGE SHON: I don't see anything giving a
4 concentration directly. I see sigmas, but I don't see
5 chi over Q or anything like that.
6 WITNESS BEYEA: They did not serve to
7 illustrate in this paper the airborne concentration --
8 the chi over Q -- but it is in other documents that were
9 made available from the benchmark study.
10 JUDGE SHON: So it looks like it varies about
11 an order of magnitude and it looks like you are in the
12 middle?
13 WITNESS BEYEA: That's right. Now if you go
14 to Figure 6, when you look into the elevated releases,
15 there was such a disagreement as to the effective plume
16 rise that you had this incredible spread of many orders
17 of magnitude. And in that case the calculations that I
18 made for low plume rise and high plume rise tended to
19 match the spread in the distribution of these
20 participants in this international study.
21 JUDGE SHON: Is that in fact a source of the
22 study in your Figure 3?
23 WITNESS BEYEA: Yes, it is. In fact, I think
24 it is a replot of my Figure 3.
25 JUDGE SHON: Although you Figure 3 mentioned

1 air concentration in Figure 3.

2 WITNESS BEYEA: This is the air concentration

3 multiplied by the deposition velocity and so some people

4 probably use different deposition velocities. It

5 probably has a larger spread than my Figure 3.

6 JUDGE SHON: Thank you. I didn't mean to

7 interrupt, Mr. Blum, but I did want to clear that up --

8 just where he stood with respect to the rest of the

9 world.

10 MR. BLUM: We appreciate your clarifications.

11 JUDGE CARTER: Mr. Blum, do you have a great

12 deal more?

13 MR. BLUM: I have a very little more when I'm

14 through the very last couple of questions which have to

15 do with the documents -- Power Authority 5 and Power

16 Authority 6. This was when we had the small fracas and

17 we were instructed to do it on redirect.

18 BY MR. BLUM: (Resuming)

19 Q Now, Dr. Beyea, do you have copies of those

20 documents?

21 A (WITNESS BEYEA) I have an article in front of

22 me, the article dispute Indian Point.

23 Q That is Power Authority 6.

24 A (WITNESS BEYEA) I have that in front of me

25 and I do not have a copy of the other one in front of

1 me. I think you have it.

2 Q Okay. The -- certain statements of your were

3 read into the record, taken out of context, and we would

4 now like to --

5 MR. LEVIN: Objection to Mr. Blum's remark.

6 You are now taking out of context.

7 JUDGE CARTER: Rephrase it.

8 BY MR. BLUM: (Resuming)

9 Q We would now like to supply some additional

10 context to statements of yours that were read into the

11 record with regard to the statements on page 22 of Power

12 Authority 5, those that begin on lines 6, 7, 8, 9. Line

13 10: Est. tes of the respiratory-related death toll,

14 and ended at the end of the following sentence. "Air

15 pollution deaths might have resulted." Are there

16 footnotes in this section, Dr. Beyea?

17 A (WITNESS BEYEA) Yes, there are.

18 Q What are the numbers of those footnotes?

19 A (WITNESS BEYEA) 24, 25, and 26.

20 Q Dr. Beyea, I would now bring you the complete

21 document from which this exhibit was taken and ask you

22 to read into the record footnote number 24.

23 A (WITNESS BEYEA) "As with radiation health

24 effects, the number of air pollution deaths estimated to

25 occur from fossil fuel plant emission depends upon, one,

1 the amounts of pollutants emitted and, two, the
2 relationship assumed between health effects and dose
3 magnitude (air pollution level). The high end of the
4 air pollution consequence estimate, 100 deaths per year
5 per plant, has been derived assuming high values for
6 both factors -- one, a high sulfur fuel content, e.g.,
7 three percent sulfur coal, and, two, a high value for
8 the 'dose effects' relationship.
9 "Thus, the 100 deaths per year per plant
10 estimate has been calculated in a pessimistic manner, an
11 approach which is consistent without taking in this
12 report for calculating the upper range estimate for
13 cancer deaths resulting from calculated accidents."
14 And then I go on to say -- do you want me to
15 read the rest of it?
16 Q Sure.
17 A (WITNESS BEYEA) "A general survey of studies
18 which have derived quantitative estimates of the
19 relationship between fossil fuel power plant emissions
20 and deaths and can be found in S. K. Keeny" -- that's
21 K-e-e-n-y -- "et al., Nuclear Power Issues and Choices,
22 Ballinger, Cambridge, Mass., 1977, Channel 5. Reference
23 25 is an example of work done at Brookhaven National
24 Laboratories which provides the high end of the spectrum
25 of estimates." And there are just some more technical

1 footnotes.

2 Q Thank you, Mr. Beyea. Turning now to Power

3 Authority 6 on page 64 of that document, in the middle

4 of the third column, you were asked to read into the

5 record the sentence beginning "If the only defensible

6 alternative presented at the hearings." Do you see that

7 sentence now?

8 A (WITNESS BEYEA) Yes, I do.

9 Q Could you read the preceding sentence in its

10 entirety, please?

11 A (WITNESS BEYEA) "If an alternative to Indian

12 Point can be found which appears to be relatively benign

13 from a health point of view which would not raise

14 electrical bills dramatically and which would not

15 seriously exacerbate the oil import situation, I think

16 most people would opt for the alternative, even with the

17 recognition that we might learn 30 years from now in the

18 absence of reactor accidents that we have been too

19 cautious."

20 Q Dr. Beyea, I now ask you, taking into account

21 your concerns about pollution caused by the use of coal,

22 is it your opinion that the Indian Point nuclear power

23 plant should be shut down as a result of these hearings?

24 MR. BRANDENBURG: I'm going to object to that

25 question, Mr. Chairman. I think this witness has come

1 here as an expert on modeling consequences. I don't
2 know that he has expressed any expertise in making the
3 societal value judgments here, such as the question
4 implies.
5 MR. LEVIN: Moreover, Your Honor, it is the
6 ultimate question, I think, for somebody to decide, but
7 not for this witness.
8 MR. BLUM: Your Honor, it is the Licensees who
9 opened this up over strenuous objections. They read
10 into the record statements, the only possible relevance
11 of which was to insinuate that Dr. Beyea did not believe
12 the Indian Point power plant should be shut down. We
13 moved to strike those. The Board was permissive in
14 letting them in.
15 Having let in these insinuations taken out of
16 context, we are all entitled to hear Dr. Beyea's actual
17 opinion, and that will be the end of my direct.
18 JUDGE CARTER: I think Mr. Levin is correct.
19 That is the ultimate question that these proceedings
20 will have to determine based on the evidence that was
21 given. That is the decision that the NRC has to make
22 and I think that is too conclusory, if I may use that
23 phrase, and I don't think that was the thrust or the
24 main subject matter of his testimony.
25 His testimony had to do with the evaluation o

1 the emergency response.

2 MR. BLUM: May I ask Dr. Beyea to clarify the

3 statements of his that were read into the record as

4 insinuations?

5 MR. LEVIN: Objection to what insinuations to

6 the contrary. Mr. Blum has a habit of calling things

7 unfair and unreasonable and now it insinuations to the

8 contrary. If he has a question to put to the witness,

9 let him put it.

10 BY MR. BLUM: (Resuming)

11 Q Dr. Beyea, the statements of yours that were

12 read into the record under cross examination from the

13 Power Authority: Do these statements in any way

14 indicate that you do not believe the Indian Point

15 nuclear power plant should be shut down as a result of

16 these hearings?

17 MR. BRANDENBURG: Objection.

18 MR. LEVIN: Objection.

19 (Laughter.)

20 JUDGE CARTER: Good try.

21 MR. BRANDENBURG: A little too obvious, I

22 think.

23 JUDGE CARTER: I think we've heard enough and

24 we are quite sure as to what the answer would be from

25 both sides to the same question.

1 WITNESS BEYEA: I don't think that's the right
2 question. I don't think that's correct.
3 JUDGE CARTER: I think we will take a
4 ten-minute recess and then we will hear the recross.
5 MS. FLEISHER: Excuse me, Your Honor. While
6 we were talking about exhibits and all, I would like to
7 go on the record or ask you to note that we have several
8 of us back here who have not received any of the Power
9 Authority exhibits or Con Ed exhibits.
10 JUDGE CARTER: Will you see Ms. Fleisher gets
11 copies?
12 MS. FLEISHER: I prefer to have them while the
13 witness is on the stand.
14 (A brief recess was taken.)
15 MS. POTTERFIELD: With the permission of the
16 Board, I would ask to follow up on an answer that went
17 unanswered during Dr. Beyea's testimony. The panel
18 agreed to find an answer for Mr. Kaplan and bring it in
19 this morning. I was asked to follow up on that question.
20 I would ask the Board's permission.
21 JUDGE CARTER: What is the question?
22 MS. POTTERFIELD: The question, Dr. Beyea, is
23 yesterday Mr. Kaplan asked you about the width of the
24 area of contamination that would result in New York City
25 in the event of an accident such as you have described

1 in your testimony with the winds blowing toward New York
2 City.
3 Have you been able to do those calculations or
4 to find your calculations and tell us the answer?
5 WITNESS BEYEA: Yes, we have. The width in
6 question refers to Figure 5 on page 39. The width of
7 the outer contour of the dark line is about ten miles
8 and the inner contours would be about three miles.
9 MS. POTTERFIELD: Thank you.
10 JUDGE CARTER: Thank you.
11 Mr. Colarulli.
12 MR. COLARULLI: Mr. Chairman, I have no
13 recross. However, I do have a motion.
14 JUDGE CARTER: Well, excuse me. Are there any
15 questions of Intervenors or interested States on
16 redirect? All right. I hear none.
17 Mr. Colarulli.
18 MR. COLARULLI: Mr. Chairman, neither the
19 Power Authority nor Con Edison has any recross.
20 However, at this time I would like to make a very brief
21 motion.
22 JUDGE CARTER: All right.
23 MR. COLARULLI: The Power Authority moves to
24 strike the testimony of Dr. John Beyea and Brian Palenik
25 because it fails to consider both the probabilit of

1 releases and the consequences of those releases and is
2 not plant-specific. The Commission directed in footnote
3 5 of the September 1981 order that approximately equal
4 attention should be given to the probability of
5 occurrence of releases and the probability of occurrence
6 and the environmental consequences and that such studies
7 "will take into account significant site and
8 plant-specific features."
9 Dr. Beyea's testimony acknowledges that their
10 analysis is not dependent upon any plant-specific
11 analysis of probability of a PWR-2 release at Indian
12 Point, the type of release upon which Dr. Beyea has
13 based his calculation of consequences
14 Accordingly, because his testimony neither
15 addresses plant-specific features or the probability of
16 occurrence of releases, it fails to comply with the
17 Commission requirements and should be stricken.
18 MR. BLUM: Does the Board wish to hear
19 argument on this motion?
20 JUDGE CARTER: Have you finished?
21 MR. COLARULLI: I believe Mr. Brandenburg has
22 an additional related ground.
23 MR. BRANDENBURG: Mr. Chairman, Con Edison
24 would like to join in the motion made by the Power
25 Authority for the reasons stated. The other possible

1 candidacy that this testimony has for being stricken
2 from the record in this case would be under Questions 3
3 and 4, the subject of emergency planning.
4 Last Friday, on June 25, we had a rather
5 instructive discussion with the members of the Board on
6 exactly what the limits of this proceeding on emergency
7 planning topics was, and I might refer the Board to page
8 2131 of the transcript, where Judge Paris curtailed a
9 line of questioning that I was pursuing with the FEMA
10 witnesses on the ground that the scope of our emergency
11 planning inquiry in this proceeding was confined to the
12 "status and degree of conformance with NRC-FEMA
13 guidelines of state and local emergency planning, et
14 cetera."
15 Mr. Blum aided us with a very accurate, I
16 think, in light of yesterday's and today's cross
17 examination, a characterization by Mr. Blum of the Beyea
18 and Palenik testimony that appears on page 2163 of the
19 transcript.
20 At that page of the transcript, Mr. Blum
21 states as follows: "This" -- and here he is referring
22 to the Palenik-Beyea testimony -- "deals with the
23 adequacy of emergency planning in the following sense.
24 It is evidence that according to a modeling of expected
25 consequences by the NRC's own PWR-2 consequence model,

1 the emergency evacuation is too slow to get people out
2 before they will receive early death doses in a number
3 of areas. This is exactly what that testimony is
4 about."
5 Now this is not evidence and testimony which
6 is addressing the current status and degree of
7 conformance with NRC-FEMA guidelines expressed in
8 NUREG-0654 and other related document. It is, instead,
9 something quite different if it is truly, as we urged
10 upon the Board last week, a probabilistic safety
11 assessment material that runs afoul of the Board's
12 requirements on evidence on that subject.
13 If the Intervenors persist in the notion that
14 this is emergency planning testimony, then it runs afoul
15 of the Commission's questions on emergency planning
16 which form the basis for Judge Paris' remarks on Friday,
17 the 25th, appearing in the transcript on page 2131, and
18 particularly in light of the characterization of that
19 testimony by Mr. Blum that I just quoted.
20 JUDGE PARIS: Mr. Brandenburg, you said I
21 curtailed your questioning. I don't recall curtailing
22 your questioning. I may have suggested I thought you
23 were wasting time. Would you like to read what I said?
24 MR. BRANDENBURG: I certainly can. I believe,
25 to be perfectly accurate, Judge Paris, that Judge Carter

1 asked me to pursue another line.

2 JUDGE PARIS: Well, don't bother reading it.

3 MR. BRANDENBURG: Page 2131, line 8. "Judge

4 Paris: Mr. Brandenburg, the Board was asked by the

5 Commission to advise it of the extent to which the plans

6 conform with FEMA standards. I don't think we can go to

7 the Commission and say 'Mr. Commissioner, they don't

8 conform to the FEMA standards, but it doesn't matter

9 because it is not necessary.' You can't do that.

10 "Mr. Brandenburg: Mr. Chairman, if it is the

11 Board's ruling that all we are concerned with here is

12 the adequacy of the plans pursuant to NUREG-0654

13 guidelines, if it is, I will indeed drop this line of

14 questioning.

15 "Judge Carter: That is certainly part of it.

16 Plus, the application and whether it has been done

17 rationally and reasonably."

18 JUDGE PARIS: Thank you.

19 JUDGE CARTER: Mr. Blum.

20 MR. BLUM: Well, with regard to Mr.

21 Brandenburg's point, the answer begins with simply

22 looking at the wording of Commission Question 4, which I

23 don't have in front of me now. But the gist of that is

24 in addition to conducting the inquiry of the status of

25 conformity with FEMA and NRC guidelines, as Question 3

1 requires, Question 4 calls for -- I can quote it: "What
2 improvements in the level of emergency planning can be
3 expected in the near future and on what time scale, and
4 are there other specific offsite emergency procedures
5 that are feasible that should be taken to protect the
6 public?"
7 And there have been numerous rulings from this
8 Board all the way through that this means we are
9 conducting a larger inquiry into the overall state of
10 emergency planning and whether it is adequate to protect
11 the public.
12 Secondly, the guidelines themselves -- that
13 is, as articulated in 10 CFR 50.47 and 50.54 -- call for
14 emergency plans that are adequate to protect the health
15 and safety of the public, and they have a couple of
16 other phrases that are similar to that which would then
17 also mandate this kind of inquiry under the rubric of
18 even determining compliance with the actual regulations.
19 Mr. Brandenburg's particular problem came up
20 in a different way where I believe what he was trying to
21 do was launch into a comparison of the state of
22 emergency planning at Indian Point with the state of
23 emergency planning at Three Mile Island and possibly
24 other nuclear plants as well. And Judge Paris correctly
25 advised him that we were focused on Indian Point

1 site-specifically, and beyond that we were concerned
2 with the conformity of the Indian Point's emergency
3 plans with FEMA-NRC guidelines.
4 But I don't think it would be fair to read
5 Judge Paris' statement as contradicting all of the other
6 things he has said previously and all the other rulings
7 of the Board which were quite explicit.
8 Now with regard to the Power Authority's
9 motion, this is basically the same ground we have been
10 over and over again where they have made numerous
11 applications to the Board that unless -- well, it is
12 usually to the effect that there can be no consideration
13 of consequences without a probability figure attached to
14 them at the same time and that has been rejected by the
15 Board.
16 Dr. Beyea has included a discussion of
17 probability and also it is not an accurate
18 characterization of his testimony to say that he did not
19 look at site-specific features. He testified twice in
20 response to questions that he did look through specific
21 alleged improvement at the Indian Point plants and found
22 that they would not significantly alter his model or his
23 calculations for the consequences for these plants.
24 Therefore, they -- you know, it would be
25 unfair to accuse Dr. Beyea of not looking at this plant

1 specifically, and certainly his whole analysis is
2 predicated on this site-specifically.
3 JUDGE CARTER: I have a question of the
4 attorneys. Is it your position that the Doctor's
5 testimony is not relevant to Contention 3.6, which
6 reads: "The emergency plans and proposed protective
7 action do not adequately take into account the full
8 range of accident scenarios and meteorological
9 conditions for Indian Point Units 2 and 3?"
10 MR. BRANDENBURG: Mr. Chairman, to the extent
11 that emergency planning -- emergency plans for any
12 particular site are required by NRC-FEMA guidance to
13 take into account the range of accident scenarios and
14 meteorological conditions, then the subject of this
15 testimony would fall within Question 3. But there is no
16 allegation that I am aware of in Dr. Beyea's or Mr.
17 Palenik's testimony that the Indian Point emergency plan
18 does indeed fail to comply with the meteorological or
19 accident scenario requirements imposed by NRC emergency
20 planning guidance.
21 JUDGE CARTER: If we were to ask him that
22 question, we would then fall into the same trap that
23 Professor Blum fell into of asking him the ultimate
24 question.
25 Judge Paris?

1 JUDGE PARIS: I would like to ask the parties
2 a question concerning interpretation of Commission
3 Question 1, as revised in the September 18 order.
4 Looking at footnote 5, let me read the last sentence of
5 that. "Although not requiring the preparation of an
6 environmental impact statement, the Commission intends
7 that the review with respect to the question be
8 conducted consistent with the guidance provided the
9 Staff in the statement of interim power policy on
10 nuclear power plants and consideration of the
11 Environmental Policy Act of 1969, 44 FR 4101.
12 Footnote 5. Footnote 5 read: In particular,
13 that policy statement indicates that attention shall be
14 given both to the probability of occurrences of releases
15 and with the environmental consequences of such
16 releases. The reviews "shall include a reasoned
17 consideration of the environmental risks (impacts)
18 attributable to accidents at the particular facility or
19 facilities..." No, the quote continues. I am sorry.
20 "Approximately equal attention should be given to the
21 possibility of occurrence of releases and the
22 probability of occurrence and the environmental
23 consequences..." And such studies "will take into
24 account significant site and plant-specific features..."
25 I would like to know whether it is the view of
the parties that this means that the investigation shall

1 give attention both to the probability of occurrence of
2 releases and environmental consequences of such
3 releases, or does this mean that each witness who
4 testifies on either consequences or on probabilities
5 must give equal attention to both?
6 MR. COLARULLI: It is the Power Authority's
7 view, Judge Paris, that each witness who presents an
8 analysis of risk must include the two elements of risk.
9 One is the probability of occurrence of a release and
10 the other is the probability of the occurrence of the
11 consequences. And, as you have just read, and it is
12 very clear from the next sentence as well, that this
13 analysis must be plant-specific.
14 I might just add that you cannot, like love
15 and marriage, the probability of plant-specific and
16 consequences plant-specific go together*. We cannot
17 hook up stray consequences with stray probabilities.
18 JUDGE CARTER: I have a little trouble with
19 your analogy. I have been working on a metaphor as
20 well, and it seems to me that our difficulties arise
21 from a desire to have the distinctions between risk
22 scenarios, probabilities, emergency planning to be as
23 distinct as oil and water, when in point of fact they
24 are more like gin and vermouth.
25 (Laughter.)

1 There is a great mixing that goes on, and it
2 is very hard to separate them or, as some law teachers
3 tell their students, you can't unscramble scrambled
4 eggs. Judge Shon has a question.
5 JUDGE SHON: The questions pertain to Dr.
6 Beyea's testimony. If you would like to have me ask
7 them and then get on with the motion, we could do that,
8 but I think we might well deal with the motion before
9 us.
10 (Board conferring.)
11 JUDGE CARTER: For the reasons we have all
12 stated, the motions are denied.
13 Judge Shon?
14 JUDGE SHON: There are a couple of little
15 loose ends I would like to find out. I direct you to
16 Table 3 at page 30 of your testimony. You have
17 presented a series of cancer deaths, estimations of
18 cancer deaths in various situations. They all pertain
19 to the same population in the same sector.
20 Have you added up the total population in this
21 sector?
22 WITNESS BEYEA: In the 22.5 sector?
23 JUDGE SHON: Under population and sector, the
24 third column, in each case -- one day, two days, three
25 days -- the population in each 7-1/2-degree wedge is

1 listed as 31,508 in the ten to twenty miles and so on.
2 Have you added these up to give a total population?
3 WITNESS BEYEA: You have 2.3 million people.
4 JUDGE SHON: About 2.3 million. You note that
5 over a period -- and I believe you said it would be a
6 period of perhaps 50 years --
7 WITNESS BEYEA: That is correct.
8 JUDGE SHON: On the one-day case, 1,300 to
9 13,000 deaths would occur.
10 WITNESS BEYEA: Uh-huh.
11 JUDGE SHON: Do you have any cancer deaths for
12 over a period, the 50-year period in there, of 2.3
13 million population?
14 WITNESS BEYEA: Of that population, about 16
15 percent would die of cancer.
16 JUDGE SHON: And that 16 percent would then
17 be --
18 WITNESS BEYEA: So that would then be 370,000.
19 JUDGE SHON: 370,000 or about twenty times as
20 many as your largest number.
21 WITNESS BEYEA: Let me point out our largest
22 number is the 50,000.
23 JUDGE SHON: I meant on day one.
24 WITNESS BEYEA: Day one.
25 JUDGE SHON: So you are talking in this day

1 one case, at any rate, of something between one-half and
2 one percent of the total cancer deaths.
3 WITNESS BEYEA: Well, it's more like three
4 percent. You said it was about a factor of 30 or so.
5 JUDGE SHON: I thought we had it at 275,000
6 and this went from 1,345 to 13,450.
7 WITNESS BEYEA: So as a percentage of the
8 fraction that would eventually die of cancer, it ranges
9 from about .3 to three percent, then.
10 JUDGE SHON: Okay. It's a number about like
11 that.
12 Do you happen to know whether that kind of
13 variation in cancer deaths over a period like that is
14 readily detectible by epidemiological methods? Is it
15 something that stands out? Gee, cancer went up .8
16 percent in the past 50 years. Is it something readily
17 detectible?
18 WITNESS BEYEA: It would certainly be
19 detectible in terms of thyroid cancer and I think it
20 would be difficult to attribute -- I think it would be
21 difficult statistically to see that in the overall
22 cancer figures unless there were some specific cancers
23 which are very radiation-sensitive.
24 JUDGE SHON: I see.
25 WITNESS BEYEA: I think it would be very

1 difficult to see the effect of that statistically. Now
2 I suppose if you got closer to the plant where the doses
3 are higher, you would then perhaps get above the
4 statistical uncertainty. But I think overall you would
5 not be able to detect statistically the consequences,
6 except for thyroid cancer.
7 JUDGE SHON: Your estimates do include
8 leukemia, don't they? They are not just solid tumors?
9 WITNESS BEYEA: They do include leukemia.
10 JUDGE SHON: That seemed correct to me.
11 And then on page 39 you have a note on Figure
12 5 to the effect that this highly contaminated area --
13 that is, the one in the middle -- would have perhaps a
14 five percent increase in cancer. Again, that is the
15 same order of magnitude of things, a few percent.
16 I take it that would not be readily detectible
17 or identifiable either.
18 WITNESS BEYEA: Well, if they lived there,
19 that would be a five percent risk of cancer that would
20 then account for about a 33 to 40 percent increase in
21 the cancer rate. I think that would be detectible.
22 JUDGE SHON: I see. I misunderstood your
23 footnote. I thought it was a five percent increase in
24 risk of cancer.
25 WITNESS BEYEA: No. It's five percent of the

1 people would get cancer.

2 JUDGE SHON: I see. There were two other

3 things. Your prompt death threshold, Table 1 at page

4 18, I had originally thought that was 100 rem, but I

5 realize it is 200 rem used as a prompt death threshold.

6 The column that says with minimal treatment, I

7 notice it says .11. Does that mean that at this

8 value -- that should be 250 to 300. I'm sorry. It's

9 the next one -- 200 to 250 is .11. That's right. It is

10 .11, is it not?

11 WITNESS BEYEA: Yes.

12 JUDGE SHON: Does that mean there would be

13 approximately a ten percent or eleven percent cancer

14 death for what you call the threshold?

15 WITNESS BEYEA: Yes. There would be an eleven

16 percent chance of death within 60 days.

17 JUDGE SHON: So the chances would be 8-to-1

18 against.

19 WITNESS BEYEA: That is correct.

20 JUDGE SHON: Lastly -- I think it is last --

21 did you take any account -- I don't believe you did --

22 for wind shear in your calculations?

23 WITNESS BEYEA: No. To a certain extent that

24 is already covered in the dispersion coefficients which

25 are, you recall, based on semiempirical data and so in a

1 real plume there is some wind shear that has been taken
2 into account. However, there is some debate in this
3 field as to whether that is sufficient to take --
4 whether that is sufficient to that which is already
5 included in the dispersion coefficients.
6 JUDGE SHON: I recall in particular a very
7 impressive photograph in a publication on meteorology in
8 Atomic Energy some years ago, in which one could see
9 plumes of smoke on a meteorological tower going at cross
10 directions away from each other. As they went up the
11 tower they went in cross directions.
12 WITNESS BEYEA: I'd like to note that the fact
13 that wind shear would create a dispersion close to the
14 plant does not necessarily mean the consequences are
15 reduced. When you actually do certain calculations, you
16 find that the number of early deaths are limited by the
17 number of people who are exposed. In some cases, a
18 wider plume leads to actually more people being exposed
19 to severe consequences.
20 But I think it is a good point. My
21 understanding at this point is that for the size of the
22 plume that is going to rise for a short release, wind
23 shear is not considered to be a major weakness in
24 consequence models at this time.
25 JUDGE SHON: One last thing. In your 50 to

1 500 cancers per million person rem, there has been some
2 recent dispute subsequent to the publication of BEIR-3
3 hinging about work done by Mendelsohn and Lowe
4 concerning a reanalysis of the Hiroshima bomb
5 consequences and the Atomic Bomb Casualty Commission
6 work there. Some people have indicated that that should
7 push these coefficients higher.
8 Do you know what the current status of that is
9 and is it in any way outside of your range of 50 to 500,
10 or do you have that in effect covered too?
11 WITNESS BEYEA: I think that is already
12 covered in my numbers. That, as most aspects in this
13 field, is in dispute. There has been a long series of
14 letters written to Science about the net impact of this
15 on the dose coefficients. I believe, as I recall, that
16 we are still talking here about a factor of two and I
17 think that my numbers include that.
18 JUDGE SHON: Thank you. That is all.
19 MR. BLUM: Your Honor, I have two questions
20 about latent cancer deaths. One is a follow-up to one
21 of Judge Shon's questions, and the other is,
22 unfortunately, something I just forgot that I was
23 supposed to come back to and clarify.
24 BY MR. BLUM: (Resuming)
25 Q With regard to the latent cancer deaths

1 calculated in the Table we have just been looking at, is
2 it known whether the age distribution of these cancer
3 deaths would be the same or different from the age
4 distribution of cancer deaths in the population
5 generally?
6 A (WITNESS BEYEA) Well, the assumption of the
7 relative risk model is that the risk will follow the
8 risk of death in the population and so that kind of
9 distribution -- well, let me just say there are
10 different assumptions about that that I think are
11 covered in my range of 50 to 500.
12 So -- well, I don't think I answered your
13 question. Maybe I should try it again.
14 JUDGE SHON: I thought you answered it rather
15 well indeed. He said that the very basic assumption
16 that leads to the higher value really, which is the
17 relative risk model, suggests that the age dependency of
18 the cancer is not distinguishable. Is that not
19 correct? The relative risk model says you get more
20 where you had more to begin with.
21 MR. BLUM: Thank you.
22 BY MR. BLUM: (Resuming)
23 Q The other question is: Earlier during the
24 cross examination, Dr. Beyea, you mentioned that you had
25 made more refined calculations in totaling latent

1 cancers and have compared these with your earlier
2 calculations. Could you state the gist of these refined
3 calculations and the comparison?
4 MR. LEVIN: Your Honor, we object to these.
5 There was no recross. I don't see any reason why there
6 should be any more redirect.
7 JUDGE CARTER: I'll allow the question.
8 WITNESS BEYEA: It is a very small change. I
9 would just like to put it down for the record. We made
10 refined calculations taking into account some better
11 modeling, correcting some errors. We averaged the
12 numbers over the D and E stability classes and we found
13 that the numbers reported for the 6,000 to 50,000 would
14 drop about less than ten percent.
15 JUDGE CARTER: Is that it, Mr. Blum?
16 MR. BLUM: That's it.
17 JUDGE CARTER: Mr. Colarulli, do you have any
18 questions?
19 MR. COLARULLI: No questions.
20 JUDGE CARTER: Mr. Brandenburg.
21 MR. BRANDENBURG: No. I would like to talk
22 about a plan for next week.
23 JUDGE CARTER: Does Staff have any questions?
24 MS. MOORE: No recross.
25 JUDGE CARTER: You are excused, Dr. Beyea and

1 Mr. Palenik.

2 (The witnesses were excused.)

3 JUDGE CARTER: The schedule we have for next

4 week. Next week, all I have on my schedule is a call

5 from Miss Weiss on Monday. There will be no calls from

6 Mr. Sohinki on Wednesday.

7 Now the following week, on the 19th is New

8 City. Mr. Thorsen was kind enough to give out

9 instructions concerning the location of the Clarkstown

10 Hall on Maple Avenue in New City and how to get there,

11 with a map, and we will do this. Because of some

12 difficulty Staff may have in transporting their papers,

13 we are going to start the hearing at 10:00 on Monday

14 morning.

15 MS. POTTERFIELD: Mr. Chairman, for the

16 benefit of giving notice to all of the parties, in the

17 event that Mr. Thorsen's witnesses finish before the end

18 of the week, the Intervenors will be ready to present

19 their witnesses 22 through 32 in that order, just so

20 everyone knows.

21 MR. HASSLE: Judge Carter, one minor matter I

22 have -- a transcript correction. The transcript dated

23 June 25, 1982, at page 2163, lines 2 and 3, where it now

24 reads "Mr. Blum's objection," it should read "Mr.

25 Brandenburg's request."

1 MR. THORSEN: Your Honor, just --

2 MR. LEVIN: Your Honor, could we have some

3 identification of witnesses? We have had so many

4 schedules filed, I am not really sure which witnesses 22

5 through 32 we are talking about. Could we just have an

6 identification of those?

7 MR. BRANDENBURG: And in which order?

8 JUDGE CARTER: Could we have that, please?

9 MR. THORSEN: Your Honor, perhaps we could

10 cover Rockland County first, since Rockland County was

11 going first.

12 JUDGE CARTER: Well, Mr. Thorsen did give us a

13 list.

14 MR. THORSEN: I do have a couple of small

15 comments. I have one correction. The name of Glenn

16 Everhart should be added as number 16. That testimony,

17 I believe, was mailed out with all the other testimony.

18 And then two other items, Judge.

19 Today I passed out the testimony of John

20 Grant, the Chairman of the Legislature. It is very

21 brief. I don't believe his cross examination should

22 take very much time.

23 I have also listed the Honorable Benjamin

24 Gilman as being a Rockland County witness. It is

25 unclear at this time whether he is simply going to make

1 a statement or whether he will actually be a witness.
2 But I believe to accommodate him we will take his
3 testimony. I would ask that we take his testimony as
4 the first witness on the afternoon of the 19th.
5 MR. BRANDENBURG: Mr. Chairman, we have no
6 prefiled testimony from any Mr. Gilmans -- Congressman
7 Gilmans. The rules of practice of the Commission
8 clearly require the filing of any such testimony two
9 weeks prior to the time he is to be cross examined, and
10 at this time I would like some direction from the Board
11 that those rules would be complied with respecting such
12 witnesses.
13 JUDGE CARTER: Would you inquire of the
14 Congressman whether his testimony will be in the nature
15 of evidence or whether he merely wants to make a
16 statement in connection with the proceeding, and if the
17 former, would you see that you immediately get a copy
18 for all parties?
19 MR. THORSEN: Judge, his office has been
20 developing some written testimony. They promised they
21 would mail it to me as soon as he has seen it and
22 approved of it. You know, maybe that should be on the
23 record.
24 (Laughter.)
25 And as soon as I see it, I will know what is

1 going to happen.

2 MR. BRANDENBURG: So the record is clear, Con

3 Edison doesn't have any objection whatsoever to

4 Congressman Gilman or anyone else making a limited

5 appearance statement, but to the extent that testimony

6 is sought to be adduced we would wish to adhere to the

7 requirements of the Commission's rules of practice.

8 JUDGE CARTER: I think that if he proposes to

9 present real testimony or evidence in connection with

10 the case and if his testimony will not be available

11 until very late, we may want to postpone his appearance

12 in order to give the parties an opportunity to see it

13 and we will all look forward to the cross examination of

14 the Congressman by the attorneys and the Board.

15 Now, let's get to Mr. Brandenburg's question,

16 Miss Potterfield. Can you give some names?

17 MS. POTTERFIELD: Yes. It is the same numbers

18 that we've had on every index that we have been asked to

19 give out. Number 22 is Kenneth Ingenido. Number 23 is

20 Lucy N. H. Conklin. Number 24 is Miles Lavell. Are you

21 with me?

22 MR. LEVIN: Which of these -- will they be in

23 the same order that they are listed here and in the

24 panels that you have identified here?

25 MS. POTTERFIELD: That is what we plan to do.

1 JUDGE CARTER: All right. Is there anything
2 further to come before us? I hear nothing.
3 MR. LEVIN: Your Honor, the list from Rockland
4 County, are any of those witnesses to appear in panels?
5 JUDGE CARTER: Mr. Thorsen, are any of your
6 witnesses to be in panels?
7 MR. THORSEN: No, Judge, they will all be in
8 panels.
9 MR. PIKIS: One final question, Your Honor.
10 Could we get some specific identification of the
11 witnesses who will be presented on the first day?
12 MR. THORSEN: I intend to present my witnesses
13 in the order they are listed. The first witness will be
14 Sam Gdansky. If Congressman Gilman is not permitted or
15 is not available, we will go on. As the next witness,
16 the following witness will be James Kraelick, followed
17 by James McGuire, Don McGuire and straight down the list.
18 MR. SOHINKI: Mr. Chairman?
19 JUDGE CARTER: Mr. Sohinki?
20 MR. SOHINKI: One further point. I notice
21 that Miss Posner now is in the room and if the Board
22 could inquire of her when we can expect responses to our
23 question 1 interrogatory?
24 MS. POSNER: Parents plans to submit answers
25 to interrogatories on Question Number 1.

1 JUDGE CARTER: When?

2 MS. POSNER: July 13, if that is the date that

3 is set by the Board.

4 JUDGE CARTER: If you do it then, that will

5 help things considerably.

6 MR. BRANDENBURG: So the record is clear, Mr.

7 Chairman, these are the dates for in-hand receipt. In

8 other words, that portion of the originaly discovery

9 order would apply to these answers. Your recent

10 discovery order indicated the deadlines henceforth on

11 discovery matters would be in-hand receipt dates, and

12 the purpose of my inquiry.

13 MS. POSNER: Yes.

14 JUDGE CARTER: And she said she would. You

15 will have them delivered to them by the 13th, is that it?

16 MS. POSNER: Yes.

17 JUDGE CARTER: Very good.

18 Mr. Feinberg?

19 MR. FEINBERG: I would like to note for the

20 record that I have distributed the memorandum the Board

21 requested me to prepare.

22 JUDGE CARTER: Thank you very much.

23 This hearing is adjourned until Monday, the

24 19th, at 10:00 a.m., in the Cortlandt Town Hall at New

25 City.

1 (Whereupon at 4:13 o'clock p.m., the hearing
2 recessed, to reconvene at 10:00 o'clock a.m., Monday,
3 July 19, 1982, at Cortlandt Town Hall, New City, New
4 York.)
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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ATOMIC SAFETY AND LICENSING BOARD

in the matter of: CONSOLIDATED EDISON CO OF NEW YORK(Indian Point Unit 2)
POWER AUTHORITY OF THE STATE OF NEW YORK(Indian Point Unit 3)

Date of Proceeding: July 9, 1982

Docket Number: 50-247 SP & 50-286 SP

Place of Proceeding: White Plains, New York

were held as herein appears, and that this is the original transcrip thereof for the file of the Commission.

ALFRED H. WARD

Official Reporter (Typed)

Alfred H. Ward

Official Reporter (Signature)