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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of:

PHILADELPHIA ELECTRIC COMPANY

(Limerick Generating Station,
Units 1 & 2)

Docket No. 50-352
50-353

Location: Philadelphia, Pa.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	
PHILADELPHIA ELECTRIC COMPANY	Docket Nos. 50-352
(Limerick Generating Station Units 1 and 2.)	50-353

U.S. Customs House
Old Customs Courtroom No. 300
Second and Chestnut Streets
Philadelphia, Pennsylvania 19106

Tuesday, 29 May 1984

The hearing in the above-entitled matter reconvened at 1:30 p.m., pursuant to recess,

BEFORE:

LAWRENCE BRENNER, ESQ., Chairman
Atomic Safety and Licensing Board

RICHARD F. COLE, Member
Atomic Safety and Licensing Board

PETER A. MORRIS, Member
Atomic Safety and Licensing Board

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APPEARANCES:

On behalf of the Applicant:

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On behalf of the City of Philadelphia:

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Philadelphia, Pennsylvania 19102

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I N D E X

WITNESSES:	CROSS	REDIRECT	RECROSS	BOARD
(Resumed)				
G. F. Daebeler)	11,622			
S. Levine)	(Bush)			
E. R. Schmidt)	11,667			11,675 (Morris)
G. D. Kaiser)	(Hodgdon)			11,679 (Cole)
		11,683	11,686 (Bush)	
(Resumed)				
Sarbeswar Acharya)	11,691			
Lewis G. Hulman)	(Bush)			

Recesses:	Page:
Mid-afternoon	11,661
Late-afternoon	11,690

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P R O C E E D I N G S

JUDGE BRENNER: Good afternoon. We are here to begin the evidentiary hearing on the City of Philadelphia Contentions 13 and 14, at least those portions that were admitted.

I have a cross plan which we have just received from the City, and glancing through it quickly, Ms. Bush, I don't see anything on City 13. It starts with City 14.

MS. BUSH: Your Honor, I am not prepared today to go forward with City 13, so I am going to have to ask to have the time to present that to you in the morning.

JUDGE BRENNER: All right. So you will start with City 14?

MS. BUSH: Yes. Then the way I would like to proceed is to do both Applicant and Staff. I don't care if they are on a panel or not together, but to do 14 all the way through for the Staff and then for the Applicant, or the reverse. It doesn't matter to me.

JUDGE BRENNER: All right. On that subject, we had directed last week that we have a combined panel of Staff and Applicant witnesses, absent particular good cause to the contrary, for any discrete portions thereof. I see the Staff's panel is not up there.

Ms. Hodgdon, you said you want to address that?

MS. HODGDON: Yes. The Staff has asked that the

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question of its witnesses taking the stand with the Applicants' witnesses be reexamined in light of its feeling that the decision that both panels take the stand together was made most for purposes of expedition. They do not disagree that that purpose might have been served admirable; however, they feel that -- the Staff feels that its witnesses were not always sure when to add to Applicant's witnesses' responses, especially when the material to be added might have represented a subtle addition, and they felt that they were sometimes inhibited in their responses by being on the stand with the Applicant.

Also, the Staff's witnesses' feeling was that we weren't able to -- really, there was no time before redicrect, and so the distinction between direct, cross-examination and redirect was really lost, and we were not really able to wrap up in some way in which we are accustomed to comment on the total presentation of Applicant's witness panel.

All of that we felt was -- the Staff felt that it wasn't able to have made the contribution to the record that it might otherwise have made because of that.

I believe that more or less states the feeling. Some of this may be subjective. I'm sorry if I've -- you could ask questions, if you have questions. Thank you.

MR. WETTERHAHN: Could the Applicant be heard on

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it?

(The Board confers.)

JUDGE BRENNER: Mr. Wetterhahn, go ahead.

MR. WETTERHAHN: I thought that the procedure of having the Applicant's and Staff's panel on at the same time was working well. I believe it expedited the process and allowed each panel to consider adding to what the other had said. I don't recall, however, that there were any cross-responses to any of the questions last week as far as the objections brought up by Staff counsel. I think they can be easily overcome by instructions to the witnesses from Staff counsel.

This matter was obviously discussed between Staff counsel and the witnesses over the recess in the proceeding, and I am sure as instructed by counsel, they can now proceed as required.

With regard to having some time between cross-examination and redirect, I am sure that can be accomodated without changing the entire substance of having both panels on at once. So I would, in the interest of expediting the proceeding and getting a full record, support having both panels on at once.

JUDGE BRENNER: Ms. Bush, did I hear you correctly, that you had no preference either way, so long as you could complete all your questions of all witnesses on 14 before

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going to 13?

MS. BUSH: That's correct. In my mind, I have cross-examination for the Staff and I have cross-examination for the company, and as you can see from my plan, they are totally separate. That's the way I am going to approach it. I have no objection to them all sitting there.

When I first came to the hearing last week, it was kind of strange to me to have a whole bunch of people being cross-examined, but I think I'm getting used to it now. So I really have no preference down at the bottom line.

JUDGE BRENNER: I'm just glancing at your cross plan. We haven't had much time with it, only a few moments. I don't see that clear separation that you are talking about.

MS. BUSH: The first five pages are for the Staff, and then the last two pages are for the company.

JUDGE BRENNER: I see. Thank you.

Well, I'm outvoted two to one. We will accede to the Staff's request. Speaking for myself, I would not have, because I don't think the Staff's reasons are substantial. The matter of the witnesses feeling inhibited is contrary to the instructions that all counsel should have given their witnesses in this proceeding. As Mr. Wetterhahn said, we could have cured it by pointing out that they are supposed to supply any additional information regardless of who the question is directed to, unless the

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cross-examiner objects, and then we can deal with it. You had better make sure that they have that instruction, even when appearing as a panel of just Staff witnesses .

In terms of the stated purpose of efficiency in adopting the procedure for a combined panel, that was not the only purpose. Efficiency was one of the purposes. The other purpose was to sharpen any dispute among the witnesses for both sides, and I think that would have been better served by keeping the panel together.

In terms of the blurring of the wrapping-up, so to speak, as Ms. Hodgdon put it, I think that could be taken care of in several ways. You always have that blur with follow-up questions anyway. I stated last time, we could solve any problem of counsel needing to confer briefly with the witnesses, such as by a brief recess or whatever, so I think we could have solved the problems.

Nevertheless, since you have stated that you have those problems, you persuaded Judges Morris and Cole to accede to your request. I'm rather mild about it, and I think the other two Judges were somewhat influenced for the reason that, in fact, the City's cross plan is divided between the two parties, although it remains to be seen how clearly that division remains. In any event, I don't think it's a big issue, and we will go this way.

Don't take that as the law of the case, though.

mgc 1-6

We will revisit it again, if it comes up again.

JUDGE COLE: I think the possibility of inhibition in any answer was persuasive in my vote on that issue, and it overrides any deficiencies.

MS. HODGDON: Thank you.

End 1

JUDGE BRENNER: On that point, your witnesses have now been instructed to the contrary, even if they appear separately, that is just staff witnesses. If there is anything to supplement the witnesses are to do that even if the entire panel is made up of witnesses of just one party. In the future, if we have a combined panel, you better instruct them on that also.

I think it is illusory but Judge Cole and I disagree and Judge Morris disagrees with me and it is not a big deal so we don't care and we'll move on.

Ms. Bush, the witnesses have already been sworn as you know and testimony is in the record.

Is that Mr. Finlayson next to you?

MS. BUSH: Yes, it is.

JUDGE BRENNER: We will note that he is here.

MS. BUSH: Can we go off the record for a moment?

(Discussion off the record.)

G.F. DAEBELER,
S. LEVINE,
E.R. SCHMIDT,

and

G.D. KAISER

resumed the stand, and having been previously been duly sworn, were examined and testified further as follows:

JUDGE BRENNER: All right. The court reporter should have noted that these witnesses have previously been sworn and would get a listing of which witnesses are here.

xxx

CROSS-EXAMINATION

BY MS. BUSH:

Q My first question is in the area of City 14A. I believe you begin that discussion on page 18 and that issue has to do with the base case average evacuation time of 2.5 miles per hour, is that correct?

A (Witness Schmidt) Yes.

Q On page 22, I believe you discuss the public risk as you have portrayed it on Table 2 attached to your testimony, is that correct?

A (Witness Kaiser) Yes.

Q And Table 2 is proffered to be a sensitivity of risk, public risk, of early fatality associated with various delay times and/or the evacuation speeds, is that correct?

A Yes.

Q Now I believe that you concluded as a result of this table of the runs that you did that were portrayed in the table that the predictions of public risk do not differ significantly when you use evacuation speeds ranging from 2.5 to 10 miles per hour, is that correct? I believe that conclusion is on page 23, paragraph 31?

A That's right, yes.

Q Now this table and the runs that you did to portray in the table had to do with early fatality, population health effects, did they not? Table 2?

A Table 2 presents early fatality public risk, yes.

Q Is it correct that it is -- that there are various kinds of societal risks or population health effects that are generally measured primarily being early fatalities, early injuries and latent health effects; latent fatalities, are those through the categories that are often the primary ones that are analyzed?

A Those categories are often analyzed, yes.

Q Of those three categories, is it correct that generally the early fatalities would be the consequence that you would more often see in distances closer to the plant than at distances far away from the plant?

A Yes. That is correct.

Q So, furthermore then, is it correct that latent fatalities are more likely to occur compared to early fatalities at distances further from the plant?

A Yes, it is.

Q Would you agree with me then that it might be more appropriate for examining the sensitivities of health effects at far distances from the plant, to use latent fatalities rather than early fatalities?

MR. WETTERHAHN: Objection. The contention is related to evacuation, people presumedly at least within 10 miles of the plant. It is irrelevant what appropriate measure of risk is for people far distant from the plant.

JUDGE BRENNER: It doesn't sound right to me, Mr. Wetterhahn, but I want to pull out the wording of the contention.

Do you want to point specifically to something?

MR. WETTERHAHN: I am reading from page 18 of our testimony, where we restate the contention and the 1980 study referred to is the study of the 10 mile evacuation, which used 2.5 miles per hour and that is the base case for evacuation used in t he Staff's FES also, which is the basis for the contention for within 10 miles.

End 2

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JUDGE BRENNER: Looking at the other subparts also, Ms. Bush, do you want to respond while I go through the language of the contention for myself?

MS. BUSH: Your Honor, the contention is worded in terms of evacuation time, and all of the models assumed evacuation within the zero to ten miles, and the assumptions beyond that, I believe, were sheltering or various other things.

I believe that my questions are, and the responses would be applicable to the difference between zero and ten miles. I can ask that of the witness.

JUDGE BRENNER: But your question talked about the effect at greater than ten miles.

MS. BUSH: I said far distances, and I did have in my mind -- I have in my mind Philadelphia. That is my basic concern. And latent fatalities, I believe is what we are concerned about.

But I believe the questions hold for ten miles versus one mile.

JUDGE BRENNER: I thought you were going to tell me that it was an overlap with City 13, but that is not where you are going with that question.

MS. BUSH: We would like -- yes, you are correct, Your Honor. Our ultimate goal is to have a portrayal of health effects on the City of Philadephia, a range of health

mgc 3-2

effects that potentially could occur to the City of Philadelphia, and I believe that the evacuation assumption within one to ten miles would influence the total health effects that you would see for the sectors east, south, and southeast.

JUDGE BRENNER: You want to keep the two contentions separate, and for analytical purposes in litigation, I think it would be useful to do so. What you do with them in your findings afterwards does not need to be that restricted.

MS. BUSH: That's true.

JUDGE BRENNER: Why don't you ask the alternate question that you suggested, because as I read City 14 -- and nothing you have said is to the contrary -- it doesn't deal with evacuation from the EPZ. You've had other contentions, including City 13, in which those took various aspects beyond the EPZ.

MS. HODGDON: Judge, if I may make one comment, and that is perhaps it would help if the Board understood that the Staff's testimony addresses 14 Part A as if it read "evacuation speed," because it's fairly clear that that's what it does mean -- speed of 2.5 miles per hour, instead of time.

MS. BUSH: Yes.

JUDGE BRENNER: Okay.

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MR. WETTERHAHN: I think everybody, including Applicant's panel, understood it to be that.

JUDGE BRENNER: Okay. That's a different point than we understood to be discussed.

BY MS. BUSH:

Q Dr. Kaiser, is it correct that the principles that we just discussed about the relationship of distances to the likelihood and quantity of early fatalities versus latent fatalities would apply to the difference for the points zero miles to ten miles or one mile to ten miles from the plant?

A (Witness Kaiser) I don't understand your question.

Q All right. Would it be correct that the latent effects, health effects, would be greater at a point ten miles from the plant than at a point one mile from the plant in the east, southeast, southeast sectors?

MR. WETTERHAHN: That's too general to answer. Under what conditions? Under what set of assumptions?

JUDGE BRENNER: Well, it's a fair question. Let's get the answer that it deserves, and then the cross-examiner can hone in further if that's necessary.

WITNESS KAISER: When you calculate latent cancers with the .2 code, you find that the bulk of those cancers come from distances beyond ten miles. They come perhaps several tens of miles downwind with large populations

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where individuals will receive small doses. The specific question about ten miles versus one mile is somewhat difficult to answer.

I would say in general there are more people around the ten-mile range than there are around the one-mile range, and you'd likely see more latent cancers approximately ten miles downwind than you would one mile downwind.

BY MS. BUSH:

Q Moving on to another area with regard to Table II, now I believe the results that you present there in terms of public risk, the last column on the righthand side of Table II, are probability times consequence values; is that correct, for the area of early fatalities?

A (Witness Kaiser) Yes, they are the areas under the complementary cumulative distribution function, the CCDF.

Q The values, then, that you project there, for example -- take the base case, Line 1, that would portray, would it not, an integrated value for the probability of the accident and the consequences; is that correct?

A I don't think integrated is the right word. It's the expected value in the mathematical sense. That is what the area under the CCDF is.

Q Now when you say "expected value," in the mathematical sense, does that mean -- would you explain

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further what you mean by that?

A There is a standard mathematical formula for calculating the mean number of possible outcomes of the calculation with associated probabilities. There are many different outcomes of possible accidents, because you have different source terms, different weather conditions, different wind directions. For each combination of source term, wind direction and weather conditions, there is an associated probability, and there is a calculated magnitude of consequences.

If you then take the product of that probability and the magnitude, and you sum over all possible outcomes of the accident, that is essentially the number that you have displayed in Table II.

Q Is it, then, correct that if one wanted to look at the various consequences and the probabilities associated therewith, the public risk number does not state -- as in Table II -- does not state all of those probabilities and their associated consequences? Is that a fair summary of what you just described to me?

A As I said, it's an area under the CCDF. The CCDF itself gives you more detail.

Q And if we looked at the CCDF itself, then we could, for example, look at a very low probability event and see the consequences associated with that low probability

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event, or we could look at a high probability event and see the consequences associated with that; is that correct?

A That's correct.

End 3

Q So would you agree that with public risk presentations as in Table II we have lost the sensitivity results in terms of the relationship of the probabilities to the consequences?

A I would say that these results are adequate to answer the contention.

JUDGE COLE: I'm sorry, sir, I did not hear what you said.

WITNESS KAISER: I'd say the way I presented the results here is adequate in order to address the contention.

BY MS. BUSH:

Q If we did want to look at the sensitivity relationship between the probabilities and the consequences, this table, however, would not give us that information, is that correct?

A (Witness Kaiser) That is correct, yes.

Q Dr. Kaiser, can we tell from this table whether the ratio between the clear time or the evacuation time -- if I could strike that last question, I could try to approach it again, Dr. Kaiser.

You concluded from this table and the numbers portrayed in public risk that there is a ratio of two times, I believe, in the increase in risk?

A I said factor of 2 compared with the SARA base case.

Q Factor of 2 compared with the SARA base case?

With the results stated in this way, would we be able to tell whether that ratio of 2 for the different speeds compared to the base case would also apply to the low probability events as the table indicates, it applies to the integrated or the mean risk value?

A I would expect the low probability events to be effected by perhaps a smaller ratio than you see in these areas and the reason for expecting that is that the low probability, high consequence events generally occur as the result of some unfavorable meteorological condition that affects people outside the 10-mile radius and that would not be affected by these changes in evacuation functions.

MR. WETTERHAHN: Mr. Chairman, I think our witnesses -- I think there is too much courtesy going on. Our witnesses are waiting for the questioner and they are talking among themselves but just because they are waiting.

JUDGE BRENNER: I think Ms. Bush was conferring with Mr. Findlayson, but we are waiting for another question, that is correct.

BY MS. BUSH:

Q I would like to move on to City 14B and E, which discussion starts at page 50. Specifically I would like to turn your attention to paragraph 68 on page 51.

Are there differing sheltering assumptions for

normal activity versus evacuation and if so could you tell us what those are?

A (Witness Kaiser) The most significant difference would be in the shielding factor assumed against the ground shine and for normal activity that is taken to be about .3. For people in automobiles, it is around .7.

Q .7 did you say?

A Yes.

Q What, if any, differences are there in the cloud shine shielding factors?

MR. WETTERHAHN: I'm sorry, is this for sheltering as opposed to --

MS. BUSH: Shielding.

JUDGE BRENNER: I have got a question too. Did you say cloud shine? Did you mean ground shine?

MS. BUSH: He gave me "ground shine." And it is --

JUDGE BRENNER: Now you want to ask about cloud shine?

MS. BUSH: Right.

JUDGE BRENNER: Okay.

WITNESS KAISER: I would like to correct something I just said. The shielding factor while evacuating is .5 for ground shine, not .7.

BY MS. BUSH:

Q Thank you. Do you have the value for cloud shine?

A (Witness Kaiser) Yes. While evacuating, the value is one and while in normal activity, it is .57.

Q .57?

A .57. These are all in Table 10-9 of 7.

Q Now is it correct that for City 13, which you refer to in paragraph 68, the values used for shielding were for the normal activity cases?

A They were, yes.

Q Would then the health effects increase if the case was run for the evacuation assumption as contrasted to the normal activity?

A The normal activity case that we ran for City 13 assumed 48 hours with normal activity. For people trapped on the outskirts of the city in their automobiles, I wouldn't consider running that for 48 hours; maybe as a maximum, 12 hours or to be extremely pessimistic, 24 hours, in which case I wouldn't -- I need clarification.

There are two sets of calculations which I gave answers to. One is the dose distance curves and one is a set of figures for the probability that certain health effects would occur within the City of Philadelphia. One was 48 hours, one was 24 hours in the calculation.

When I was writing the answer that we are discussing - sorry, I am getting a little confused here -- when I was trying to answer your question, I had in mind Table 8 of our

testimony, which was based on the 48 hour calculations and on the basis of that table, if one assumes that evacuees were trapped for some hours in the outskirts of Philadelphia even though the shielding factors would not be as effective, I would not expect the probability of consequences to be any higher than the kind of numbers you see in Table 8.

Q What precisely is the basis for your last statement, that you would not expect to see any difference?

A The basis is that I would not expect those trapped in their automobiles on the outskirts of the city to remain there for anything like the 48 hours that is assumed in the calculations that were done for Table 8.

Q So you have made a rough cut and a judgment that the time factor equals the shielding factor element?

A I would say it would probably more than compensate for it.

Q What is the basis for your coming to that conclusion?

MR. WETTERHAHN: Objection. Asked and answered. He just answered.

JUDGE BRENNER: No, she is probing his basis for the answer. We will allow the question.

WITNESS KAISER: I don't think I can say anything else other than what I have said, which is that although for people in their automobiles, the shielding factors would

not be as effective, they would also not remain trapped on the outskirts of the city for anything like as long as the 48 hours that was used in the calculation of Table 8.

BY MS. BUSH:

Q Have you done any runs of that nature to see the offsetting factors and how they compare to each other?

A (Witness Kaiser) I haven't done the specific case of some people moving from the evacuation zone to the outskirts of the city and waiting there for a few hours, no.

Q Well, have you done any kind of case where you look at these offsetting factors, the shielding factor versus evacuation time or exposure time?

A I didn't do such specific calculations. One has to draw a halt somewhere in these CRAC-2 runs where you get swamped by excessive detail.

On the basis of my experience in running CRAC-2, I will stick by the conclusion that I described just now, that people in automobiles marooned on the edge of Philadelphia for a few hours would suffer smaller or would receive smaller doses than those remaining there for 48 hours of normal activity.

Q Is the sum and substance of paragraph 69 -- if you want to review that quickly -- in paragraph 69, do you not basically take issue with the evacuation time of 2.5 miles per hour?

A No.

Q Are you saying that within the average time of 2.5 miles per hour there will be fluctuations?

A That's right, in CRAC-2 and CRAC what you are dealing with is an effective evacuation speed which is not necessarily the speed with which anybody would be moving at any particular point in their evacuation path.

Q Doesn't the 2.5 miles per hour include those -- purport to include those fluctuations?

A That is what I just said, yes.

Q Do you know that the 2.5 miles per hour specifically took into account slowdowns that are unique to the east, southeast and southeast sectors in the direction toward Philadelphia?

A (Witness Schmidt) The 2.5 miles and hour is based on the time estimate from zero to ten miles and did not go beyond ten miles in its analysis.

Q So in the directions toward Philadelphia, as you approach the 10 miles per hour for the east - southeast and east -- east southeast and southeast sectors, as you approach the ten mile zone, do you know that the average time of 2.5 miles per hour took into account unique population densities in that direction?

Side 2 BU

A (Witness Levine) I think the question is basically irrelevant because, as we have said in our testimony, when

the wind is blowing toward Philadelphia, the people will not be evacuating towards Philadelphia beyond 10 miles, that the emergency planning authorities will tell them to change their direction to go cross wind rather than radially and therefore I think this question is not a relevant question.

Q Well, could I have an answer to the question from someone from the panel?

A (Witness Schmidt) Could you repeat the question, please?

MS. BUSH: Court reporter, would you please repeat the question?

(Record read.)

mgc 5-1

WITNESS SCHMIDT: The assessment made considered the time to evacuate people from zero to ten miles, including road networks and population out to ten miles in all directions.

BY MS. BUSH:

Q Do you know specifically, Mr. Schmidt, whether the study took into account in concluding the 2.5 mile per hour speed the unique population density area toward Philadelphia at the ten-mile point?

MR. WETTERHAHN: Objection. It's merely a hypothetical without any foundation. There is no testimony at all that there are any unique conditions at ten miles in the direction of Philadelphia.

JUDGE BRENNER: That's correct, Ms. Bush. I was going to jump in at some other point.

BY MS. BUSH:

Q Is any one of the panel members familiar with the population distribution in the east-southeast sectors?

A (Witness Schmidt) In very general terms, yes.

Q Are you familiar with the population density in those sectors, compared to all of the other sectors? Is that a more dense population area?

MR. WETTERHAHN: I don't think we're going to get any record if we don't define what sectors at what distances from the plant.

mgc 5-2

JUDGE BRENNER: She's talking about the sector in general. She is entitled to frame the question, Mr. Wetterhahn. You can come back on redirect if you want to frame it differently.

WITNESS KAISER: For example, if you step outside the Emergency Planning Zone into the ten to 12.5 mile range, then if you look into the sectors toward Philadelphia, you are talking of 31,000 people between ten and 12.5 miles east-southeast, 21,000 people in the southeast direction. If you step to the south direction, you are talking 18,000. If you step to the west-northwest direction, you are talking 25,000.

If would seem to me that the Philadelphia direction is not unique in that respect.

JUDGE BRENNER: Ms. Bush, as a general comment, I don't think this precision is going to make a difference. Although people have been loosely discussing a ten-mile EPZ, we know, in fact, the EPZ is not ten miles in all parts. I don't think it matters. It doesn't matter to me in terms of the detail of these estimates, as I see it now. But if it's going to matter to you later, then you had better be careful now.

MS. BUSH: Thank you.

BY MS. BUSH:

Q Dr. Kaiser or Mr. Schmidt, in the analysis that

mgc 5-3

you discuss in Paragraph 68, what assumption is made beyond the ten-mile EPZ in terms of the exposure of people?

A (Witness Kaiser) Would you clarify, is this a different question from the one that you asked earlier about people being trapped on the outskirts of Philadelphia?

Q This is in that same issue, but my question, I don't believe I've asked before, and that is, what is the assumption in the model in terms of exposure for people beyond ten miles?

I'm not sure I have an answer to that question or not, so if you could answer it or answer it again.

A I'm just puzzled, as I can't give you a different answer to the one I've already given.

Q Let me try it this way.

Is it correct that in the area of one to ten miles, you assume a certain evacuation shielding factor, and you assume a certain speed of evacuation?

A That's true, yes.

Q And then in the ten to 25-mile point, you assume normal activity with a certain shielding factor; is that correct?

A The results which I refer to in Paragraph 68, I have already discussed those, which are reproduced in Table VIII. Those were done by assuming that the people in Philadelphia remain for 48 hours with normal activity.

mgc 5-4

Other calculations that were done as for the dose distance that are presented in response to City 13 were done with the assumption of normal activity for 24 hours, irrespective of the position of the person.

Q I would like to move on to Paragraph 70.

JUDGE MORRIS: Ms. Bush, I wonder if I might jump in?

MS. BUSH: Please do.

JUDGE MORRIS: I have a little trouble trying to second guess where you are going, and also a little trouble knowing whether you were understanding Dr. Kaiser and he understanding you. So maybe I will be off your point, but just for my own understanding, I would like to ask Dr. Kaiser, when you talk about an effective speed of evacuation -- the, quote, 2.5 miles per hour, for example -- what does that really mean?

WITNESS KAISER: What it really means is that in your model you have two times. One is the delay time, and then there is another time which is the time taken for the last person to leave the Emergency Planning Zone, and you calculate an effective speed by assuming that that person starts in the vicinity of the plant and moves ten miles in that time. During that time, he could be moving quite quickly in some places. He could be moving slowly in other places. He could indeed be stopped in a traffic

mgc 5-5

jam in some places. It's an average speed that we're talking about.

JUDGE MORRIS: Does the CRAC code deal in such details as starts, stops, fasts and slows?

WITNESS KAISER: No. CRAC can only take the overall effective evaluation speed.

JUDGE MORRIS: So it really says nothing about the speed of anyone at any one location at any time; is that correct?

WITNESS KAISER: That's correct, yes.

JUDGE MORRIS: And further, it would not take into account the density of population or automobiles at eight miles or nine miles; is that correct?

WITNESS KAISER: Only to the extent that the clear time that has been determined may be based on some other study, such as the NUS study which is referred to in the testimony.

JUDGE MORRIS: Was that the basis for the 2.5? The NUS study?

WITNESS KAISER: Let me make it clear that we did not choose 2.5 miles per hour in our study. We chose ten miles per hour. We were discussing 2.5 miles per hour in this testimony in order to try to address the contention. But as I understand it, the 2.5 hours per hour was chosen by the Staff for a number of reasons, one of which included

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the NUS study. but there were others based on their experience at the Indian Point site, for example.

JUDGE MORRIS: I think that helps my thinking, and perhaps yours, too, Ms. Bush. If you would like to follow up on that, feel free.

BY MS. BUSH:

Q I would just have one --

JUDGE COLE: May I?

MS. BUSH: Yes.

JUDGE COLE: Listening to your answer, Dr. Kaiser, I got the impression that delay time was included in this estimate of the 2.5 mile per hour speed, and I don't think that's so, is it?

WITNESS KAISER: No, that's not so. The delay time is separate from the additional time that it takes to move once you start moving.

JUDGE COLE: All right.

BY MS. BUSH:

Q The issue in City 14(b), that contention, that issue of concern in 14(b) is whether the average value of 2.5 miles per hour should be decreased to reflect any possible slowed evacuation time toward Philadelphia; is that correct?

A (Witness Kaiser) That seems to be what the contention is saying. As we said before, we think that it's

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really not relevant, because if the wind were blowing towards Philadelphia and taking radioactive material in that direction, the people responsible for the emergency response procedures would recommend evacuees to evacuate along routes which do not take them directly toward the city.

Q However, we can't be certain that emergency planners would know which way the wind were blowing at any given time, would we? For example, it could be blowing in the direction away from Philadelphia, people go toward Philadelphia, and then the wind move toward Philadelphia; is that a possible weather scenario, Mr. Daebeler?

A (Witness Daebeler) That is possible. Of course we do have an indication of wind direction from the instrumentation at the plant. That gives localized weather information.

Q But the weather direction could change such that at one point it was not -- the wind were not blowing toward Philadelphia and then it would.

A (Witness Levine) Yes. In such a hypothetical scenario as you pose, the cloud would have to travel a longer distance to get to Philadelphia than if it went in a straight line directly toward Philadelphia, and then it would be at lower concentrations and have less impact on public health.

Q When you say "hypothetical," you don't mean to

mgc 5-8

imply that that's not meteorologically possible.

A No, I did not mean that at all.

End 5

Q If I could direct your attention then to paragraph 70, I believe in that paragraph you discuss the particular binning of weather sequences to ensure that you get bad weather conditions, is that correct?

A (Witness Kaiser) Yes, it is.

Q And at the end of that paragraph you conclude that CRAC-2 assures that weather sequences are sampled from each bin as it calculates CCDF's. Is that correct reading of the testimony?

A It is not really a conclusion. That is what CRAC-2 does.

Q As a description?

A Yes.

Q Now in terms of presentation of CCDF's separate from the binning process, is it correct that the FES did not present CCF's for distances associated with the high density sectors of the city?

A The FES CCDF's contained -- those were the sequences that affect the city.

Q However, they do not -- the FES does not present CCDF's specifically for the distances associated with the city, the high density city area?

A If you are asking whether the FES presents the results of calculations in which the population was zeroed out except for the city, the answer is it does not and probably

the reason why not can be seen by looking at our Table 8. If you look at the first row in that table, the chances there will be one or more early fatalities in Philadelphia would essentially be the intercept on the frequency axis of the CCDF for early fatalities for the city only. And what you would see if you plotted that CCDF would be a little tiny curve in the corner, way below the one for the whole population, so the long and short of it is the contribution of the city to that CCDF would be very small.

Q Would your answer be the same with regard to whole body doses in excess of 30 rems or latent fatalities?

A The ratio would change with the effects. I would expect it to be a larger ratio for the latent effect.

Q Could it be substantially larger?

A I would guess it could be. It could be an effect in the 10-20 perdent range. That is a rough judgment.

JUDGE BRENNER: Dr. Kaiser, I am not sure I understand your last answer. Would that be a percentage change to the ratio? Or just to the contribution attributable to the City of Philadelphia or what -- because you were talking about a ratio and then you talked about a percentage change and you lost me.

WITNESS KAISER: I think my last comment would perhaps more properly be addressed to the contribution of the City of Philadelphia to the area under the CCDF latent cancer

fatalities. I must stress this is a judgment I am making off the top of my head. It may not be exactly right.

BY MS. BUSH:

Q So the FES doesn't present for latent fatalities the CCDF curve so that we could see the probability distribution at the tail ends? Some portion -- any portion of the curve?

MR. WETTERHAHN: Objection. I don't see how this is relevant to the contention at issue.

MS. BUSH: The relevance, Your Honor, is that we have asked to see the effects of bad weather and the company is stating here that that is calculated in the CCDF's and my question is --

JUDGE BRENNER: Okay, I see the relevance. Do you want to hear it, Mr. Wetterhahn?

MR. WETTERHAHN: Yes.

JUDGE BRENNER: The complaint is it's averaged together and now she is exploring whether or not treating them separately, in this case the difference between the doses attributable to the city from the rest of the population as a whole would change and what the changes would be under various bad weather scenarios, and it is another way of talking about the efficacy of binning, the procedure of sampling the bins.

MS. BUSH: To be more precise, the witness --

JUDGE BRENNER: Why don't you ask another question. We overrule the objection.

BY MS. BUSH:

Q Does the FES portray the CCDF's so that we could see the item you described in your testimony, paragraph 70, a calculation of the CCDF's?

A (Witness Kaiser) I turn to Table L.4 in the FES. That presents what is essentially the area under the CCDF broken down by distance.

Q Did you say Table L.4? Or Figure L.4?

A Table I.4.

Q Continuing, Dr. Kaiser, in looking at Table L.4, that does not show the tails of each CCDF or the CCDF curves themselves, does it?

A No, it doesn't.

JUDGE MORRIS: Ms. Bush, would it help if you focused on Figure 5.41 in asking your question, in the FES?

MS. BUSH: Page 5101?

JUDGE MORRIS: 5105.

BY MS. BUSH?

Q Dr. Kaiser, do you have before you Figure 5.1L, page 5105 of the FES?

A (Witness Kaiser) Yes.

Q You have Figure 5.4L, is that table or is the format of that table, that figure, a graphic formatted

representation of the type of information that is on Table L.4.

A The Table L.4 and the Figure 5.4L are not comparable. One of them, mainly the table, refers to societal risk and the figure refers to individual risk.

Q Thank you for bringing that to our attention. In terms of the question of presenting CCDF tail end values, neither figure 5.4L or Table L.4 present that, do they?

A Those tables -- the table and the figure that you refer to do not; however, there is in the FES's CCDF for latent cancer fatalities, which does have a tail and that is Figre 5.4D, page 586.

Q No, that table -- excuse me, that Figure 5.4D on page 5-86 portrays latent cancer fatalities for all distances out to 50 miles, is that correct?

A It does both, yes.

Q And it would be portrayed there, the latent cancer fatalities for 360 degrees around the plant?

A It would, yes, include weather sequences that affect in turn different directions, all of them.

Q So that the contribution to risk associated with Philadelphia with the high density population would not be specifically discernible on this table?

A No, but it would clearly be smaller or the curve that you might drew for Philadelphia would clearly lie below

the curves that are shown there and the tail cannot conceivably be any worse if you are looking at Philadelphia alone than it is in the figure that you have before you.

Q However, Philadelphia could present or could contribute to 20 percent, 30 percent or 50 percent of all of the risk of latent cancer fatalities associated with the plant, is that correct?

A I didn't say that.

MR. WETTERHAHN: Objection. The contention does not speak to Philadelphia alone and I don't think the Board admitted a contention which I slighted the City of Philadelphia. At least this one at issue does not. This is talking about overall risks not being correct because serious accidents are not being properly taken into account -- I'm sorry -- health consequences due to bad weather are not being taken into account. It does not isolate the City of Philadelphia.

MS. BUSH: Our concern is the City of Philadelphia and it is the bad weather effects as well as the other things.

Now it is going to come up tomorrow if it does not come up today, but I think it is relevant to today also.

JUDGE BRENNER: It is the same objection I overruled before and the reason is she is entitled to show within the umbrella of her contention that, paraphrasing now, that if you separately portray the different bad weather scenarios you will get different results or results that

are somehow more meaningful or more significant than the results already presented and she wants to show that that would be the case for Philadelphia at least in the contention.

And we are going to get to things particularly related to Philadelphia in 13, although that is a little different and the arguments are somewhat different there also.

BY MS. BUSH:

Q Dr. Kaiser, I understanding you didn't say that in your last question. You were stating that the curve would be under -- any new curve we drew for Philadelphia would be under the curves here.

But my question is slightly different, and that is, is it possible that Philadelphia's contribtuion could be 20, 30, 50 percent of the total risk?

A (Witness Kaiser) I did say in answer to an earlier question, 10 to 20 percent, but I made clear that that was an off the top of the head judgment and I don't want to say any more than that.

A (Witness Levine) If I may be able to add some perspective to this --

Q I will let you do that --

JUDGE BRENNER: Let me follow it up in answer to his previous question.

MS. BUSH: Okay.

WITNESS LEVINE: If you look at generalized

studies that have been done of latent cancer fatalities from many sites and in WASH-1400, you would find that most sites around the country do not have remarkably different latent cancer fatalities, CCDF's predicted. They are remarkably the same.

They vary by small factors, principally because you calculate latent cancer fatalities at a distance up to 500 miles from the reactor.

When you go out that far, no matter where the reactor is located, you accumulate very large populations. Generally reactors on the East Coast at 500 miles will concompass populations coming to half the population of the United States approximately.

The City of Philadelphia is about two million people. You calculate of the total latent cancer fatalities, calculated, the peaks you would accumulate about 90 perent at a distance out to 200 miles from the reactor, which far exceeds the distance of Philadelphia, so that Philadelphia has to be only a small fraction of the CCDF reported in the FES.

End 6.

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MS. BUSH: Your Honor, the witness has just put on some new evidence, and it's very complicated for me to try to do cross-examination off the top of my head. If we could have time to consider that.

JUDGE BRENNER: I think it's in the FES, and I was just confirming my recollection, and what it is is a definition of what they mean when they say they have run it out to the, quote, "entire exposed population," closed quote, so I don't think it's new at all.

MS. BUSH: We knew the distance to which they did it, and I believe it's 2000 miles. But the question is how you know what contribution Philadelphia has to that. There are offsetting factors. The further away -- New York City may be in the area considered here, but that's a far distance from the plant.

JUDGE BRENNER: Ms. Bush, you can probe it if you want to, but it seems to me a common-sense judgment, based on how the calculation was made, and the witness explains his basis for it. I must say the pace has been quite slow. I haven't commented so far, because the cumulative time has not been long. Nevertheless, I think there are a few key questions that can be asked here, and you will establish what you want to establish -- namely, that we don't present the CCDF and the FES by separate sectors.

mgc 7-2

If that's what you want to establish, the Staff or whoever you want can throw up their hands and confess guilt, and we can take it from there.

MS. BUSH: I think the way it has gone, Your Honor, is that we now have established that they have not done that. But the whole point of the testimony is why it's okay not to, and that's what I'm having to cross-examine on.

JUDGE BRENNER: But we spent quite a bit of time as to the first point, which I think was evident.

MS. BUSH: I thought it was evident, too, but perhaps I can be a more effective cross-examiner.

JUDGE BRENNER: I don't think his answer has amazingly complicated new data, so I don't know what you are asking me to do. But when you get to an appropriate time, you may ask me. But right now, I see no reason why we cannot proceed.

BY MS. BUSH:

Q Mr. Levine, is it correct that in order to determine -- is it Dr. Levine?

A (Witness Levine) No, it's Levine.

Q Mr. Levine, is it correct that there are offsetting considerations that affect how much any one given area with a certain population contributes to the overall risk, and those factors being the distance from the

mgc 7-3

plant and the population density?

A That's correct.

Q And is it your testimony here that you do not have to do a specific analysis that isolates the effect of Philadelphia to know how much Philadelphia contributes to the risk of, for example, latent fatalities?

A It's my considered opinion that the words "have to" is not appropriate. One can do such calculations. It's my considered opinion that they would not be very helpful, for the reasons I gave earlier.

Q And is that because you are making some judgment as to what contribution Philadelphia makes to the overall risk of, for example, latent fatalities?

A My considered judgment is that the City of Philadelphia represents a very small number of people compared to the total number of people considered in making latent cancer fatality predictions. Therefore, it's contribution will be relatively small.

Q Isn't the other element of that determination, besides population, the distance from the plant?

A Yes, and I'm taking that into account also.

Q So you are saying, given the distance from the plant, the weather conditions and the wind direction and the population density, it is your opinion that Philadelphia has a contribution to the risk that is not significant?

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Was that your testimony?

MR. WETTERHAHN: Objection. Asked and answered. It's the same question as the last three with no new elements.

JUDGE BRENNER: If you see anything new in there, Ms. Bush, you should tell me now.

MS. BUSH: When he answered the question, when he made the last statement, he did not take into account population density or wind direction. He said then afterwards that he did --

JUDGE BRENNER: Maybe you want to shorten up the last question and ask it differently if you think you have a new element in it, because I didn't recognize it, and maybe the witness would. But let's help him out.

MS. BUSH: Okay.

BY MS. BUSH:

Q Taking into account all of the factors that affect risk -- that is, distance, weather, population density -- what is your opinion as to Philadelphia's contribution to the risk of latent cancer fatalities?

A (Witness Levine) It would be small.

Q And by "small," what range or percentage are you talking about?

A I'm not prepared to estimate that. I have not done any calculations. I said it was my considered opinion that it would be small, and I will not give you a

mgc 7-5

number, because I don't know a number.

Q Can you give me whether it would be in the range of --

A No, I will not give you a range.

JUDGE BRENNER: Wait a minute. Let her ask the question. Then you can say you won't answer it, if that's still the case.

BY MS. BUSH:

Q You don't know whether it's a fifty percent contribution?

A I will not speculate. I don't know.

Q So it could be fifty percent, but you don't know.

A I will not agree that it could be fifty percent. You might say that, but I will not agree with it.

Q So you know it's not fifty percent?

A I wouldn't say that either.

Q Would you agree that it could be fifty percent?

A I would not agree with that.

Q So it could not be fifty percent.

A I would not agree with that.

MS. HODGDON: Objection. Argumentative.

JUDGE BRENNER: It's not argumentative. She's trying to get as precise as she can, and the witness is trying to get as imprecise as he can, and that's what happens.

MS. HODGDON: Several rounds were asked more than

mgc 7-6 1 once.

JUDGE BRENNER: It wasn't argumentative. She's entitled to be reasonable agressive and follow up. That's what cross-examination is about. As long as she is still eliciting facts or attempting to, it's not argumentative.

BY MS. BUSH:

Q Well, at forty percent, would you agree that it could be forty percent?

A (Witness Levine) I would not agree with that.

Q Would you state that it would not be forty percent?

A I would not.

Q With regard to thirty percent, would you agree that Philadelphia's contribution could be thirty percent?

A I would not.

Q Would you agree with the statement that Philadelphia contributed -- did not contribute -- let me start over.

Would you agree with the statement that the City of Philadelphia does not contribute thirty percent in terms of latent cancers?

A I would not.

JUDGE BRENNER: You could ask him if his answers are going to be the same to the same few questions as to each interval of ten percent down to however far you want to go. Then you will have the record you want.

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BY MS. BUSH:

Q Would your answer be the same for any percentage that I go down to, to five percent?

A (Witness Levine) Yes.

Q Would it be the same down to one percent?

A Yes.

MS. BUSH: We are finished with that area. Would this be an appropriate time for a break?

JUDGE BRENNER: Yes. Does that mean you're finished with --

MS. BUSH: With 3.

MS. HODGDON: On 14?

MS. BUSH: On our cross-examination plan. And I believe we are finished with 4 also. Yes, we finished 4.

JUDGE BRENNER: If you want to take a break now, we can.

MS. BUSH: Yes.

JUDGE BRENNER: I'd like to pick up the pace a little bit. We will come back at 3:20 on that clock.

(Recess.)

End 7

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JUDGE BRENNER: We are on the record.

MR. WETTERHAHN: I have one preliminary matter. We have just received the Staff's reply findings to Mr. Romano's proposed finding of fact on Contention VI-1, Roman VI-1.

If polled by the Board, Applicant would not request oral argument on those based upon its findings and its reading of the Staff's findings.

JUDGE BRENNER: Your preliminary matter is on the same subject as our preliminary matter, as it turns out. We are going to provide AWPP's representative, Mr. Romano, an opportunity to come in and have oral argument on the proposed findings that have been filed, if he so desires. On our own, we do not require it.

I will ask the Staff their feelings on the matter right now, because if the Staff wants the opportunity, then we will hold oral argument.

MS. HODGDON: The Staff, if asked, would not.

JUDGE BRENNER: Well, I'm asking.

MS. HODGDON: Yes, the Staff would not have oral argument on these findings either.

JUDGE BRENNER: All right. We will give Mr. Romano the opportunity; however, if he so desires. We are not going to require it.

And this gets us to when to schedule it. When last

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we discussed the subject last week, we ased, I guess, the Staff or somebody to first set it up for Thursday morning, which was done, and then to see what his flexibility might be for Wednesday afternoon.

Do you know what that might be, Ms. Hodgdon?

MS. HODGDON: The Staff has spoken with Mr. Romano several times and originally told him Thursday morning and now have informed him of the Wednesday afternoon, and he is available. But of course he was not asked whether he wanted oral argument. He was told that he should be available, and he said that he would be available.

JUDGE BRENNER: Ms. Bush, how much more do you think you have?

MS. BUSH: How much more do I have? Well, for the company, five minutes or less, one question really. And for the Staff, I think this might go into tomorrow. It might be done today. We would like to go later today, if it would not be too inconvenient to the parties, and then tomorrow we have anywhere from half a day to a day possibly.

JUDGE BRENNER: Well, the decision we have to make is whether to bring Mr. Romano in Wednesday afternoon if he desires argument. And if we do that and have him in for that particular time, we will break the evidentiary hearing on this subject unless he can come back again. What we would like to do is to schedule things to inconvenience as

mgc 8-3

few people as possible.

MS. BUSH: Could we assess it at the end of the day today?

JUDGE BRENNER: Yes, certainly. I'm not sure how much more we will know then, but we can certainly do that.

MS. BUSH: If, say, I am through with all of the Staff, then -- maybe late in the day tomorrow. But Mr. Finlayson has a seven o'clock plane tomorrow evening.

JUDGE BRENNER: We will assess it at the end of the day today, and of course we don't know what Mr. Romano's answer is as to whether he desires the opportunity or not.

(The Board confers.)

JUDGE BRENNER: Let's appoint somebody to contact Mr. Romano. Could we prevail on the Staff again to do that?

MS. HODGDON: Do you want it done now?

JUDGE BRENNER: Well, I won't ask it unless it's possible to do so. You have two counsel here. If you both want to be in the room, I won't ask you to do it now.

MS. HODGDON: Mr. Vogler will telephone. He was not here when we spoke about this matter, so I will need one minute to tell him.

JUDGE BRENNER: I will repeat it.

MS. HODGDON: Thank you.

JUDGE BRENNER: Because I wanted to add something to it.

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The object, Mr. Vogler, would be to tell Mr. Romano that neither the Staff nor the Applicant nor the Board on their own would require further oral argument on the findings that we have received on AWPP's welding contention; however, we will accord Mr. Romano the opportunity to come in for an oral argument on those findings if he so desires. It would be a combination of oral reply and argument by him.

If he avails himself of that opportunity, we would discuss directly the arguably substantive points raised in the findings, not the procedural rulings as to cross-examination and scope and that type of thing. Our rulings on that are already well layed out in the record, and we are not going to revisit those.

Now you should also tell him that our preliminary conclusion that the Applicant has prevailed on the contention has not been changed, and he should factor that into his thinking as to whether or not he wants oral argument. In other words, that might stimulate his desire to want to come in, because that's going to be his last chance to try to show us anything we may have overlooked. But the argument is going to be restricted to the written proposed findings.

And if you could inform him of those things, and if he could tell you whether he wants to come in or not and we know that by the end of the day today, that would help

mgc 8-5

our scheduling discussion.

However, if he wants some time to think about it, so be it. We will let him have some time, but he will have to decide presumably later this evening, and he has already been told of the possible time for this, either Wednesday afternoon or Thursday morning. And when you call him at this time, you won't be able to tell him which one. He will have to be contacted again later this evening.

You might find out if he has a big problem coming in Wednesday afternoon, and then perhaps having to come back again on Thursday morning.

MR. VOGLER: Nine-thirty?

JUDGE BRENNER: Nine.

MR. VOGLER: Nine o'clock. I'm sorry.

JUDGE BRENNER: And if we get any information on that by the end of the day today, that might help us, and we would appreciate that.

All right, Ms. Bush, you may continue now.

MS. BUSH: That was a very productive break, Your Honor. We have no further questions for the company.

JUDGE BRENNER: It would have been helpful if we had known that, so we could have the witnesses switch during the break.

MS. BUSH: They are going to have redirect.

JUDGE BRENNER: I'm sorry. We will have questions

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by the Staff.

MS. HODGDON: Yes, I have a few questions.

CROSS-EXAMINATION (CONTINUED)

BY MS. HODGDON:

Q Were any assumptions made, other than routine activity, for people outside the ten-mile EPZ, specifically with regard to the type of ingestion pathway, perhaps?

A (Witness Kaiser) I really don't understand your question. I'm not quite sure how the ingestion pathway has come into the question.

Q The question is -- relates to questions that were asked before about the lack of assumptions regarding people outside the ten-mile EPZ, and the question is whether any assumptions were made for any purposes regarding activities of people outside the ten-mile EPZ in your calculations?

A Are you referring to a specific contention, or are you questioning on the whole of the analysis we did?

Q No, I am limiting that to Question 14 and one of the tables that you offered, Table IV.

A If your question is specifically about ingestion pathways, I believe that our assumptions are identical to those in WASH-1400, and my understanding would be that they are the same as those made by the Staff for the purposes of the present testimony.

Q Is it your belief that these assumptions regarding

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people outside the ten-mile EPZ are generally conservative?

MS. BUSH: I'm going to have to object, Your Honor. I am perhaps not understanding the questions, but the reference to Table IV leads me to believe that this sounds like it's outside the scope of the cross-examination.

JUDGE BRENNER: Staff's questions are not limited to your cross-examination. They are entitled to ask their own cross-examination questions.

MS. BUSH: Oh, I'm sorry.

JUDGE BRENNER: Of that panel. Of their own, redirect would be limited to cross.

MS. BUSH: I guess I don't see the relevance of the question to the contention, so I will withdraw my objection.

JUDGE BRENNER: Do you want to reask the question, Ms. Hodgdon?

MS. HODGDON: Yes.

BY MS. HODGDON:

Q Do you believe that the assumptions that were made -- you stated what the assumptions were. Do you believe that those assumptions regarding the activities of people outside the ten-mile EPZ are generally conservative?

MR. WETTERHAHN: I'm going to object to the question. It's irrelevant to the contention. What other counsel may see or not is unrelated to the external

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irradiation of the thirty years in the ingestion pathway.

JUDGE BRENNER: You must have been in the delay case mode with that objection, Mr. Wetterhahn.

MR. WETTERHAHN: The case is still pending, and there is no answer.

JUDGE BRENNER: You mean the question is still pending.

MR. WETTERHAHN: The question is still pending.

JUDGE BRENNER: There's been an interruption. Maybe I misunderstood.

I thought, Mr. Vogler, you were going to call Mr. Romano. If you want to stay here, that's okay.

MR. VOGLER: I would prefer to be here.

JUDGE BRENNER: All right. I just wanted to make sure we were on the same wavelength. But you are free to stay if you think you need to.

I don't understand exactly what the question is, Ms. Hodgdon. Maybe if I did, I could rule on the relevance. Why don't you tell me what point you are going after?

End 8

MS. HODGDON: The question was generally with regard to the City's questions regarding certain calculations that should have been made for the City of Philadelphia being outside the limits of the ten-mile EPZ and the question -- the answer that I got was that the assumptions that were made were the same as those in WASH-1400 and the same as those made by the Staff.

And my next question was whether those in the panel's opinion, the doses that the City of Philadelphia considered to be important for it, were conservatively derived. I mean, was it a part --

JUDGE BRENNER: Wait.

MS. HODGDON: Yes, I'll stop there.

JUDGE BRENNER: You want to go back to the comparison that was asked about and the ratios of the general cases that were run to what one might expect if they had been broken down differently for Philadelphia?

MS. HODGDON: Yes. I wanted to tie this in to the City's assertions regarding Philadelphia and I was going to ask -- the question is really whether what was done regarding Philadelphia as a part of the population beyond the ten miles was done with the appropriate conservatism.

JUDGE BRENNER: And where is that in Contention 14?

MS. HODGDON: It relates to a question that was asked regarding Contention 14, regarding health consequences

under certain weather conditions.

JUDGE BRENNER: All right. I just don't see the relationship between that subject and the question you asked.

You need to be much more precise. You see the question is quite broad as you asked it and I don't want to revisit unnecessarily the whole broad area unless it is to make a new point. So, as asked, I am going to sustain the objection that it is too general to be probative and material and helpful to us in deciding this contention.

That does not mean that you might not find some preciser limit that you might want to follow up on them.

MS. HODGDON: I will withdraw the question for now, because I think perhaps it is more appropriate to 13.

JUDGE BRENNER: The objection has been sustained, so you don't have to withdraw it but you can ask another one.

MS. HODGDON: I'm sorry, I didn't hear that. I was talking to the witness.

BY MS. HODGDON:

Q With regard to adverse -- the health consequences related to bad weather scenarios, in certain weather conditions following a hypothetical severe accident and the increase in early and latent health effects that might be caused by various adverse weather scenarios, is it your opinion that certain weather could -- such as rain, could exascerbate the health effects of an accident?

A (Witness Kaiser) Clearly, the consequences of an accident are dependent on the weather conditions and there are certain weather conditions that give you greater consequences than other weather conditions. Those have been taken into account in our calculations and in the Staff's calculations in producing the CCDFs and the tails of the CCDFs give you the -- give you those cases, combinations of source terms and weather conditions which are the worst cases.

Q Did you say that the worst cases are included?

A Yes, they are included in the calculations of the CCDFs.

Q Can sheet covers and wet handkerchiefs, the use of sheet covers and wet handkerchiefs reduce inhalation doses?

A They can, yes.

Q Is that taken into account in calculating a dose that people would use such protection?

A No, it is not, at least in our calculations.

Q In your opinion, with certain dose estimates that you have predicted beyond 10 miles, in your opinion would it be reasonable for authorities to advise that protective actions - that any protective actions be taken beyond ten miles?

A Yes. We have said that many times last week. We believe it would be very reasonable for the authorities to recommend various ad hoc measures which would protect the public from the accumulation of radiation does.

Q In your opinion, is it possible that CRAC or CRAC-II can miss, may have missed certain very bad weather conditions?

A Frankly, yes, it is possible. It is more likely with CRAC than with CRACII.

Q Would you expect that a CCDF of societal doses in excess of 30 rem whole body for Philadelphia would be a very small fraction of the total societal dose?

A I think the question is not specific enough. We can produce CCDFs of the number of people who receive more than 30 rem or we can produce CCDFs of population dose. It is not clear to me which you are asking about.

Q Would it help if I said given a CCDF for population dose?

A Would you repeat the question?

Q Yes. Given a CCDF of a dose in excess of 30 rem whole body for Philadelphia, would you expect that would be a small fraction of the total societal dose?

JUDGE MORRIS: Excuse me, Ms. Hodgon. I don't understand that question. Are you saying Philadelphia gets a dose different than people at the equivalent distance in a different direction?

MS. HODGDON: No. That would be the number of people receiving a dose of 30 rem or more in Philadelphia compared with the total person-rem for that accident sequence?

JUDGE MORRIS: I still find the question unbounded. Which way is the wind blowing? That is just an example of why I don't think the question is bounded. I think you have to be much more specific.

MS. HODGDON: I don't think it makes any difference if you ask it this way, and that is the total number of people in Philadelphia that would be receiving a dose of 30 rem or more as compared with the total number of people everywhere receiving that dose without regard to the wind direction or any other boundaries, the expected value -- if that can be done without regard to specifics of --

JUDGE MORRIS: I'll let the witnesses try to answer it.

WITNESS KAISER: I find that your quesiton has many different answers. It would depend on the weather conditions. You might find cases where the vast majority of people affected above 30 rem were closer than Philadelphia to the reactor. You might find a rare weather condition where Philadelphia contributed the most. You might find conditions where the City is not affected at all above that dose level.

So I find it difficult to see the point to which you are directing the question.

BY MS. HODGDON:

Q Your answer is then that in order to answer the

question, you would have to know the weather, the wind direction?

A (Witness Kaiser) If I understand your question, yes.

Q We spoke earlier about FES Table L.4, if you could find that table. Does it include the tails of the CCDFs? Does it include consideration of the tails in the CCDFs?

A It includes consideration of the tails in the CCDF's, yes.

Q Does it indicate a jump in risk at distances to Philadelphia?

A If I read down the total column, starting maybe at 15 miles, I see three minus three, two minus three, between 20 and 25, eight minus three, 25 to 32, minus two; 30 to 35, sent seven minus three.

It seems to me the answer to your question is that there is some kind of jump at that point.

Q Thank you.

JUDGE BRENNER: Have you completed, Ms. Hodgdon?

M.S HODGDON: Yes. I have no further questions for the panel.

xxx

EXAMINATION BY THE BOARD

BY JUDGE MORRIS:

Q Dr. Kaiser, I just have a few question to make sure the record is clear on a couple of points.

One, could you give a definition of shielding factor, as used in your calculations?

A (Witness Kaiser) Yes. It is the ratio between the dose rate in terms of exposure to gamma rays received by a person who is shielded by some structure to the dose rate he would receive if the same level of deposited contamination were on an infinite flat plane; in other words, basically the ratio of dose rates with and without the structure in question.

Q Thank you.

Earlier in the cross-examination, there was discussion of the CCDFs and the question was asked about a high probability event as portrayed by the CCDF and I was a little bit confused by that in that it seemed to imply that particular sequences were portrayed by the CCDF and I thought actually the way you have drawn that -- those curves, it is not with respect to sequences but with respect to consequences, is that correct?

A It is correct, yes.

All sequences contribute to that curve.

Q Right. But the phrase "high probability event" is the one that bothered me a little bit.

A Yes, from the CCDFs you are not able to point the finger at a particular consequence and say that emerged as a result of a given event in say terms of weather and that event

had a certain probability.

Q Did you or Mr. Levine want to amplify on that?

A Well, we perhaps wanted to add if you look at the CCDFs in the FES or in SARA, there is nothing there that can be construed as being a high probability.

All of the events are of low probability per year.

Q Changing the subject, in consideration of the dose that people might get if they either sheltered or maintained normal occupation activities as opposed to evacuating, assuming that the plume has passed the -- radiation plume has passed and has deposited shine on the ground, is the residual shine from the atmosphere?

A No.

Q With respect to the activity on the ground which produces ground shine, say after 24 hours, is there some characteristic decay associated with it?

A The bulk of the dose delivered by that means comes from radionuclides which have half-lives of one day or more. Does that answer your question?

Q Partially.

I don't want to push you too far in trying to make calculations in your head, but between the period of say 24 hours and 48 hours after the accident, how much would the ground shine decrease?

To put it another way, how would the dose rate

decrease?

A Yes. That would depend to some extent on weather conditions during that period as to whether there were mechanisms for, say, washing the radioactive material off the surfaces. If there were no such mechanisms operating, as I said, you are talking radionuclides with half-lives of a day or more.

They are like Tellurium-132, which has about a day as its half-life. Iodine-131 has a half-life of eight days. I would not expect to see a great decline in the rate between 24 and 48 hours. You might be talking of a factor of less than two.

Q Thank you.

There was considerable discussion of trying to separate out the effects on the population of Philadelphia as opposed to the rest of the world.

As a first rough cut, why is it inappropriate just to compare the populations?

A That is because different health consequences affect different groups of people. For example, the latent effects are very often spread out over large populations and large distances whereas the early effects, such as early fatalities, are generally confined to within ten miles or even less of the reactor.

So it is not a totally trivial matter to describe

which group of the population should be compared with which.

Q Supposing I drew two circles, one with a radius of ten miles -- a radius of twenty miles, and another one, a radius of 25 miles, and looked at the population only in a ring, so defined.

Would it then be inappropriate to simply look at populations as a first rough cut?

A I think that would be -- yes, it is a rough cut, quite a reasonable thing to do.

Q At least it would tell you whether there were really significant differences, is that correct?

A Yes, sir.

Q Thank you.

JUDGE MORRIS: That is all I have at this time.

xxx

BY JUDGE COLE:

End 9.

Q Gentlemen, on page 53 of your testimony, Item 73.

mgc 10-1

You refer to the FES, Page 5-80, and you quote part of a sentence from that, "adverse site conditions that would cause long delays before evacuation."

The kinds of delays you are talking about there are what? Six hours, based upon what's indicated in 5-80, or up to six hours?

A (Witness Kaiser) Yes, sir. I believe that that particular relocation scheme has a delay time of six hours, and what you say is correct.

Q All right, sir. And that is what is assumed in preparation of Table -- at least, in part, -- preparation of Table M-1(a) in the FES?

My question is, exactly how did you calculate also the factor of four? What numbers did you use? What items?

A Yes. In Table M-1(a) under the heading "From Causes Other Than Severe Earthquakes," and in the first row you see the number 1 X 10^{-3} presented, and under that a figure, 4.

A Yes. And my understanding how this table is to be read is four times as great as it was for the calculations done for the base case evacuation, the two-hour delay at 2.5 miles per hour.

Q That's what the 4 means there?

A Yes.

mgc 10-2

Q I guess I couldn't get that from anything else on that page. Is there a key on there that says that's what it is?

A (Witness Schmidt) You have to read the text, I believe, to explain that. I believe it is in there.

Q The text associated with Table M-1 is --

A (Witness Kaiser) It's on Page M-1, the third paragraph.

Q All right, sir. You aren't comparing Column 1 with Column 2 to get a factor of four, then.

A No, I wasn't.

Q All right, thank you.

In the next item, next page, next item, page 54 of the testimony, Item 74, in the first sentence you indicate that you arbitrarily assumed bad weather four percent of the time, and then made some calculations on that basis.

I guess my question is the use of the word "arbitrarily." Don't we know what fraction of the time we would have bad weather, and why didn't you use the actual value?

S2BU

A Yes, there would be a whole spectrum of different weather conditions which would affect evacuation speeds and so on to different extents. Within the CRAC-2 evacuation model that we used in SAFA, there was already some allowance

mgc 10-3

for bad weather conditions, since the database on which that model is based included fog and rain and snow. However, that database did not cover all possible weather conditions, and in order to try and see what additional effect there might be -- I had in mind the kind of weather conditions which would produce quite a serious slow-down in evacuation speed, and those conditions would basically be snowfall, say, and I chose four percent because I was confident that that was an upper bound on the number or fraction of days per year in which snowfall would occur to such an extent that people could only evacuate at the one mile per hour speed that I chose here as the representative speed.

And since choosing that four percent, I have looked at publications of the Department of Commerce which tell us that in the Philadelphia region, the average number of days per year in which you get more than one inch of snow is between five and ten, which is, in fact, less than that four percent. So about three percent.

Q All right, sir. I think you have explained how you got the number satisfactorily. I don't think the word "arbitrarily" describes it accurately.

A I see.

Q All right, thank you.

In the last part of Item 74 on Pa. 54, you indicate that using this four percent and slowing it down,

mgc 10-4

the evacuation speed, to one mile per hour, you wind up with a difference of something less than five percent.

Five percent of what, sir? What is it? What are you comparing there?

A Yes. The area under the CCDF for early fatalities would increase by somewhat less than five percent.

Q All right, sir.

You have identified this as a sensitivity study, but you have only one item included in that, a four percent difference, indicating that then provides a four percent assumption of the weather which gives you a five percent difference in early fatalities.

Did you do any additional calculations to see what would happen if it was two percent, or what would happen if it was eight percent bad weather?

A No, I didn't, but it would be close enough to assume that it's a linear effect over that kind of a range, so that if you put in two percent of the time, the five percent would go down to, say, two and a half percent.

Q All right, sir. Thank you.

JUDGE BRENNER: Redirect?

REDIRECT EXAMINATION

BY MR. WETTERHAHN:

Q Panel, in response to a question asked by the Staff, you were asked whether CRAC or CRAC-2 may have missed

mgc 10-5

some bad weather conditions in its sampling process.

Could you comment hypothetically, assuming what the certain weather conditions were that were missed, what the effect on the risks that you estimate would be?

A (Witness Kaiser) The effect would be most noticeable at the tail of the CCDF. I would not expect it to affect the area under the CCDF by very much.

Q Why not?

A The area under the CCDF tends to be dominated by lower consequence events at somewhat higher frequencies.

Q You also answered that CRAC-2 was better at picking up these low probability bad weather scenarios.

Could you explain why? In particular, the reference, the adoption of CRAC-2 that you used in SARA.

MS. BUSH: Objection, Your Honor. I believe this is covered in the testimony. There is a specific discussion of the binning.

JUDGE BRENNER: Yes, I know. It's Paragraph 70, I think, if I recall correctly.

What's your objection? That it's repetitive?

MS. BUSH: Repetitive, yes.

JUDGE BRENNER: Mr. Wetterhahn?

MR. WETTERHAHN: The question was raised on cross-examination, and the answer elicited was, "CRAC-2 is better at picking up these scenarios." I am certainly

mgc 10-6

entitled to explore the reasons why it is better than any other code as used by the Applicant.

JUDGE BRENNER: All right. The objection is overruled. We will allow that follow-up on redirect.

WITNESS KAISER: The first thing CRAC-2 does with the weather data that it has is to sort it into the 29 bins mentioned in the testimony. These bins are designed so that they include the kinds of weather sequences that you expect to give you the high consequences, such as those sequences in which the plume might encounter rain beyond ten miles from the reactor.

Once that sorting process has been completed, CRAC-2 ensures that it samples from each one of the 29 bins, so that in the calculations that it does, it includes some weather sequences that do have these features of rain beyond ten miles and so on.

With CRAC, as it is normally used, the weather sequences are sampled at equal intervals throughout the year, and the standard interval is four days and thirteen hours, which gives you an equal weighting between daytime and nighttime, but does not necessarily ensure that you pick up the rain events beyond ten miles.

MR. WETTERHAHN: No further questions. Thank you.

JUDGE BRENNER: Any follow-up based on that, Ms. Bush?

mgc 10-7

MS. BUSH: I think I might have something, if I could have just a second.

JUDGE BRENNER: All right.

(Pause.)

MS. HODGDON: We will try to give you a report about Mr. Romano.

MR. VOGLER: It was an extremely difficult conversation. I refused to tell him whether or not he should appear. It is up to him.

JUDGE BRENNER: Right. It is up to him.

MR. VOGLER: In spite of his insistence. If he appears, it will be at nine o'clock on Thursday morning. If he cannot make it at nine o'clock on Thursday morning, he will either call Ann Hodgdon or Ben Vogler Wednesday night at their hotel. That is about the substance of a fifteen-minute conversation.

JUDGE BRENNER: All right. We will have a reaction to that by the end of the day today, and we will impose upon the Staff to make one more call to transmit our reaction, because we won't leave things at that, obviously.

MR. VOGLER: All right. We will call him tonight.

RECROSS EXAMINATION

BY MS. BUSH:

Q Dr. Kaiser, you were asked a question about utilizing a donut shape around the plant measuring the

mgc 10-8

distance 25 miles or 20 to 30 miles as a rough cut of the effect on Philadelphia.

Do you recall that question?

A (Witness Kaiser) Yes.

Q Is it correct that if you are looking at that ring around the plant, the donut shaped ring for 20 to 30 miles, that one element you would not have if you attempted to use that 360 degree donut as a proxy for Philadelphia is the element of population density that affects latent health fatalities?

MR. WETTERHAHN: Objection. There is no basis for the hypothetical that population density affects health fatalities.

JUDGE BRENNER: There is some confusion here. Give me a moment. I'm not sure you understood the answer. I assume you are following up on Judge Morris' question?

MS. BUSH: Yes.

(The Board confers.)

End 10

mgc 11-1

JUDGE BRENNER: Give us another chance, Ms. Bush, and listen to the answer.

JUDGE MORRIS: I think maybe my question was a little ambiguous. Let me have a colloquy with Dr. Kaiser.

The band that I chose was 20 to 25. I am willing to make it 20 to 30, whatever. But in that donut or ring, whatever, there is a total population, and there is a population within each radial sector. And the point of my question was to determine the relative effect on the population in Philadelphia, which, let's hypothesize, are confined within two pie-shaped sectors intersecting that ring, with the total population in the ring, one could get a very rough cut at the relative consequences to the Philadelphians as opposed to the rest of the people in that ring.

Now, Dr. Kaiser, have you been listening?

WITNESS KAISER: Yes.

JUDGE MORRIS: Is my -- well, let me ask the question.

Can you make such a rough cut conclusion based on the preamble that I just gave?

WITNESS KAISER: Yes, I think so, as long as it's recognized that it's a rough cut.

JUDGE MORRIS: I tried to emphasize that. I hope that's been helpful, Ms. Bush.

mgc 11-2

JUDGE BRENNER: Ms. Bush, could we get another question, if you have one?

MS. BUSH: I will ask a clarifying question, and I think this is consistent with what Judge Morris asked.

BY MS. BUSH:

Q Are you indicating that we could look at the health effects in that ring, and to get a rough cut measurement of the effects on Philadelphia, you could take the population proportion that the sectors of Philadelphia contribute and apply that to the total person-rem exposure?

A (Witness Kaiser) Yes.

Q Dr. Kaiser, then when you are saying it is a rough cut, are you saying that the values for the tails might be different than the value for the mean that we just discussed?

A Yes, I believe it would not be appropriate to make the same kind of ratioing for the tail as you do for the area under the CCDF.

MS. BUSH: I have no further questions.

JUDGE BRENNER: Staff?

MS. HODGDON: We have no questions.

JUDGE BRENNER: Applicant?

MR. WETTERHAHN: We have no re-redirect.

MS. BUSH: Your Honor, my adivsor just suggested one more question to clarify the record, and that is, do you have an opinion whether the fraction would be greater

mgc 11-3

or smaller for the tails compared to the mean?

WITNESS KAISER: Tails of CCDFs arise from one particular weather sequence and in one particular direction affecting one particular group of people. It's not something that can be averaged around a 360-degree donut or anything like that. I think you should not try and do that with the tails. It's not an appropriate thing to do.

BY MS. BUSH:

Q And so you don't know whether the fraction would be larger or smaller? You have no way of knowing? Or what are you saying?

A (Witness Kaiser) The tail is the tail, and it would not change. That's what I think.

MS. BUSH: That's all the questions I have. Thank you.

JUDGE BRENNER: Any follow-up on that last late question?

MR. WETTERHAHN: No, sir.

MS. HODGDON: No.

JUDGE BRENNER: All right. We can switch witness panels to the Staff's witnesses, and then we will have you gentlemen return for City 13 after we go through the Staff on 14.

Let's take a brief recess until 4:35 on that clock.

(Recess.)

End 11

mgc 12-1

JUDGE BRENNER: All right. We are back on the record.

Staff's witnesses, as we know, have previously been sworn.

Whereupon,

LEWIS G. HULMAN

SARBESWAR ACHARYA

resumed the stand and, having been previously duly sworn, were examined and testified further as follows:

JUDGE BRENNER: Do you have any preliminary matters, Staff?

MS. HODGDON: No.

CROSS-EXAMINATION

BY MS. BUSH:

Q I am going to start on Page 2 of my cross-examination and dispense with the earlier questions.

Would you turn to Page 13 of your testimony, please?

Now I believe with regard to City 14(b), you agreed with the assertion, but with several conditions that you discuss at the bottom of Page 13 and on Page 14; is that correct?

A (Witness Acharya) That's correct.

Q And I believe in the first condition, you state that an accident must occur that releases a large amount of

mgc 12-2

radioactivity to result in high radiological doses substantially beyond the ten-mile EPZ, situations that have been associated with some of the low probability events in the FES.

What is the highest probability event that would result in high radiological doses substantially beyond ten miles?

A (Witness Hulman) May we have an opportunity to consult the FES, please?

Q Certainly.

A (Witness Acharya) We did not examine the individual sequences with the high or low probability that would result in high doses beyond the ten-mile EPZ. But if you look at the Table 5.11C of the FES and compare the probabilities there in Table 5.11D, you would notice that the accident sequences that have higher probabilities relative to the others have in general the release accidents associated with them of smaller magnitude than the others.

A (Witness Hulman) We cannot point to specific sequences. We did not do our calculations in that manner. But one must have the right combination of release conditions and source terms and weather conditions in order to have consequences beyond ten miles that are substantial. Not all of these sequences, we don't believe, would contribute to early health effects beyond ten miles, for example.

mgc 12-3

Q Is it, then, a fair summary of your testimony that you have not done the analysis that would be able to tell you the range of the probability of events that would result in high doses substantially beyond ten miles?

A (Witness Acharya) For the assessment of the risk of a downwind dose, we combine all the accidents probablistically. We have not separated into separate clusters of accidents, the groups of accidents, no.

Q With regard to the third condition that you discuss on Page 14, you talk there, do you not, about the accident with a release of substantial quantities of radioactivity with the wind blowing toward Philadelphia initially and continuing to blow in that direction and certain atmospheric diffusion conditions? Does that cover the four points that you discuss in your third point?

A (Witness Hulman) I don't understand your question. We have listed four items. You have quoted from the third and asked whether it includes them all. I don't understand.

Q Did I correctly summarize the four points that you have under your third condition, the middle of Page 14?

A (Witness Acharya) I don't think so, because the fourth point -- the question was whether the one that was mentioned -- that is, the third one -- does summarize all four of them.

Q Let me start over again.

mgc 12-4

Within the third condition that you have, which is your second full paragraph on Page 14, is it correct that you indicate that there must be an accident with substantial releases of radioactivity, the wind must initially be blowing toward Philadelphia, and must continue to blow toward Philadelphia, and there must be particular atmospheric diffusion conditions that would allow the plume to be in Philadelphia and in certain concentrations?

A The fourth one says that the evacuees must continue to move in the direction of Philadelphia, knowing full well that the plume is heading toward that direction, instead of moving away in the crosswind direction.

Q I was talking about the one before that.

A (Witness Hulman) If your question is, do we agree today with everything that's in the third paragraph, if that's your question, as I understand it, --

Q Yes.

A -- I might modify it a bit to say that the wind doesn't initially have to blow toward Philadelphia, but sometime during the accident it has to blow toward Philadelphia in order to influence doses in Philadelphia.

Q Fine. Good point.

My basic question is, for all of those conditions that you just discussed, including the modification , is it correct that the CRAC model would include all of those

mgc 12-5

various conditions in its calculation? Does it attempt to reproduce those circumstances that would result in an exposure in Philadelphia?

A (Witness Acharya) It does include all these conditions, but it does not include the fourth one in a precise way, because even if the evacuees would be moving in the crosswind direction, our simplified evacuation model, either in CRAC or CRAC-2, you assume as if the evacuees are moving in the downwind direction.

A (Witness Hulman) I would like to add to that one, if I may. I believe CRAC attempts to model those conditions. It doesn't necessarily always achieve perfection, but it does attempt to model them.

Q And is it also correct that putting aside for a minute the fourth paragraph, which I would like to defer to discussion later, is it correct that the CRAC model has the capability to take into account the circumstances that we have just discussed and to output latent cancer fatalities that would result, including those conditions that we just discussed?

A (Witness Acharya) The answer is yes.

Q And wouldn't the CRAC model outputs that we have just discussed of latent cancer fatalities be portrayed with differing levels of probability that would inherently reflect the probability of the wind going in that direction

mgc 12-6

and the probability of the atmospheric diffusion conditions, et cetera?

A That's correct. It would.

Q Now to move to paragraph -- your fourth condition.

With regard to the practical aspects, in your opinion, of the people being trapped in the area toward Philadelphia, I had a few questions. I believe you indicate here that the Emergency Evacuation Coordinator would advise people to avoid the plume, so that they would not be trapped in the plume; is that correct, or would you like to resummarize?

A Yes, that's the assumption.

Q Would you agree that conditions could occur such that the Evacuation Coordinators would not know from minute to minute which direction the plume had moved in or was about to move in?

A Any assessment of that would be highly speculative at this point in time.

Q As a practical matter, could you envision that, given, say, the area from 10 to 30 miles just in the two east-southeast sectors, that emergency planners would be able to know at all times the direction of the plume, and further that they would be able to communicate that to the people that are traveling in those sectors?

A I believe that it would be very possible in an

mgc 12-7

emergency situation of a serious reactor accident.

Q So it is your opinion that it would be possible for Emergency Coordinators to know the direction of the plume, so that they could tell evacuees to avoid this road or that road within the east-southeast and southeast sectors of the 10 to 25 mile area?

A They may not be able to advise so specifically to evacuees on every and each road or street, but they would be able to advise as to the direction of the plume to groups of evacuees in different areas and the evacuation routes, but not specifically -- not necessarily specifically to evacuees on each evacuation road or street.

Q Now in your opinion, if some evacuees were in a certain area -- say, in the east-southeast sectors in the 10 to 25 mile zone -- would, in your opinion, the Emergency Coordinators know, say, fifteen minutes ahead of time what direction the wind was blowing in, so that if they could communicate with all the people, they could tell them which way to go?

A (Witness Hulman) May we confer?

(The witnesses confer.)

End 12

13rg1

A (Witness Hulman) I believe the answer to your question is yes, it is quite likely for the situation you described.

Q I might have misstated my question. I meant the question to be to know 15 minutes in advance which way the wind would be blowing in the subsequent 15 minutes.

A That is a different question than you asked me.

Q Okay.

A Where?

Q For the people in Philadelphia, if they were evacuating in the Philadelphia -- toward Philadelphia, would the emergency planners be able to know 15 minutes ahead of time that the wind was going to blow away from there or toward there?

A I believe it is quite likely.

Q That they would know 15 minutes ahead of time?

A Quite likely, yes.

Q Is that based on some familiarity with meteorological conditions and how the wind direction changes in this geography or in any geography?

A In part, yes.

Q What particular experience is that?

A I have studied meteorology in Philadelphia and its surrounding areas. I have also some familiarity with meteorology in the rest of the country but that is not the

only basis. The basis is there is a long time after a severe reactor accident such that the planners in the City of Philadelphia should have adequate time and even though there may be a wind variability, they have adequate time to take protective actions if they deem it appropriate.

Q What about the hypothetical situation where the advance information was that the wind would not be blowing toward the City of Philadelphia and that is the planning assumption: people are evacuating in that area and there is a wind change.

Can you testify with confidence that there is a certainty or a large certainty that the planners would be able to know 15 or 20 minutes ahead of time that the wind variable would occur?

A (Witness Acharya) Yeah. That is very likely because the wind directions -- my assumption is that they will be constantly observed at the site meteorological tower and if there will be any changes in the wind direction, particularly an indication that the wind is going towards Philadelphia, and since wind will take about -- well, if it is a high wind, like ten miles per hour, it will take at least two hours to reach the outskirts of Philadelphia, so in fact the warning or advice can be given fairly well ahead of even 15 minutes from the observation of the wind directions at the the site meteorological tower.

Q Assuming the wind is blowing in the south direction, do you have an experience in weather variability and the ability of meteorologists to predict weather variability, that they would know 15 minutes in advance, for example, that the wind direction is going to change?

JUDGE BRENNER: I want to make sure that I understand the question. You have the wind blowing towards the south?

MS. BUSH: Yes, towards the south, I mean.

JUDGE BRENNER: All right.

WITNESS HULMAN: I don't understand your question. You say you have the wind blowing toward the south?

BY MS. BUSH:

Q Yes.

A (Witness Hulman) Is your question, does the meteorologist know within 15 minutes whether it is going to change direction?

Q Yes.

A Sometimes he does; sometimes he doesn't.

Q Do you know what percentage of the time he would?

A No.

JUDGE BRENNER: Ms. Bush, we have got miscellaneous matters to discuss with respect to the timing of any oral argument on the welding findings. Are you coming to a convenient point to break?

You mentioned wanting to go a little longer. I didn't know what you had in mind or why, but I don't want to go too much longer.

MS. BUSH: I am at a convenient spot. I am at the end of that -- I finished that number four, so it is a convenient time to break.

I would be happy to break at the normal time today instead of going late because I thought about the time. It would be more productive for me to spend the time getting ready for tomorrow than to be in the hearing room.

JUDGE BRENNER: Fine. I should note that we went with you first because originally we were disposed that way, when we thought the panel would be combined and I thought it would be more efficient. I hope there are no problems with that, instead of having the Applicant cross-examine first.

MS. BUSH: No, it's worked out fine for me.

JUDGE BRENNER: All right. I am sorry we put you in a position of making a difficult phone call, Mr. Vogler, but we do appreciate your helping us out.

I thought previously that Mr. Romano would be available tomorrow afternoon. Did I hear correctly that -- one element of your last conversation is that he would not be?

MR. VOGLER: I asked Mr. Romano at least four times about Wednesday afternoon, and he replied the same each time. He has water problems and business problems and

he will not be available on Wednesday afternoon.

JUDGE BRENNER: All right. This is what we will do. We will establish the oral argument time if Mr. Romano requests to have that time for 9 a.m. Thursday morning.

MR. VOGLER: I did that. I'll do it again.

JUDGE BRENNER: Call him and tell him that is our direction or as soon thereafter as we get to it, but he has to be here at nine in case we get to it at the very beginning.

He also has to advise us one way or the other not later than noon tomorrow as to whether or not he wants to take advantage of that opportunity and I would appreciate if you could set up some means of getting that advice to us either by call from you back to Mr. Romano or through some other procedure and that we will all know what the schedule is going to be no later than -- I say noon tomorrow.

What we will do is break for lunch and then you will have that opportunity right after. We will be in recess --

JUDGE MORRIS: Different subject, Mr. Wetterhahn.

Among the materials you hand-deleivered to us today were some copies of draft evacuation time study excerpts.

Could you enlighten us as to the purpose of giving us that?

MR. WETTERHAHN: Yes.

As the Board is aware and I think has reference in

one of the contentions, the original evacuation time study done by NUS in 1980 was being redone for the Commonwealth of Pennsylvania. Just on Friday, the evacuation time estimate which addresses -- I believe it is Appendix 4 of 0654 was released by the Commonwealth, or to the Commonwealth in draft form.

Because we were discussing evacuation time estimates and sensitivity studies, I thought it might be interesting for the Board to have just the times. There was not sufficient time to have the entire document reproduced. It is being reproduced now and hopefully will be made available to the Board and parties tomorrow or Thursday.

I really don't believe it -is appropriate to litigate any of the numbers but for background purposes, since it was noted in the contention, I thought I would provide the draft time estimate summary and on a quick reading some of the charts which I personally thought might be of interest or relevant to the time estimate summary.

It is by no means complete and it was by no means any attempt to be complete as far as deciding which parts of the reports were relevant.

JUDGE BRENNER: Well, first of all, you have attempted preliminarily to solve an arguable disclosure obligation that somebody might raise later, I believe, and you have done that. To the extent that it might be

interesting, that is the substance of it, to us or any other party, that is besides the point. Nothing is interesting to us unless somebody puts it in the record and tells us why we should be interested in it, so we are not going to do anything with it unless a party asks us to do something with it or unless we on our own, as the course of the cross examination proceeds, decide that we want to do something with it.

I just want to make that clear. I think you understand that.

MR. WETTERHAHN: Yes. It is, I understand, relevant to one of the offsite emergency planning contentions so I assume it will be considered at that point of time.

JUDGE BRENNER: I wasn't addressing that at all. My remarks just now were solely in the context of the severe accident contentions.

One more miscellaneous subject. We have seen the Applican'ts supplemental motion on the changes to the implementing procedures for the onsite emergency plan and we infer from the copy of the letter there and so on that the parties are actively discussing the matter, or at least we hope they are.

We want to know what the resolution of that is sooner rather than later in light of possible schedule impact next week. So we hope we hear about that as soon

as feasible. Tomorrow would not be too soon.

MR. WETTERHAHN: We will attempt to find information about that.

JUDGE BRENNER: All right. Thank you. We will be back at nine o'clock tomorrow morning.

(Whereupon, at 5:05 p.m., the hearing was adjourned, to reconvene at 9:00 a.m., Wednesday, May 30, 1984.)

End 13.

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CERTIFICATE OF PROCEEDINGS

This is to certify that the attached proceedings before the NRC COMMISSION

In the matter of: Philadelphia Electric Company

Date of Proceeding: Tuesday, 29 May 1984

Place of Proceeding: Philadelphia, Pennsylvania

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

Mimie Meltzer
Official Reporter - Typed

Mimie Meltzer
Official Reporter - Signature