

ORIGINAL

OFFICIAL TRANSCRIPT
PROCEEDINGS BEFORE

NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

DKT/CASE NO. 50-537
UNITED STATES DEPARTMENT OF ENERGY
TITLE PROJECT MANAGEMENT CORPORATION - TENNESSEE VALLEY
AUTHORITY (Clinch River Breeder Reactor)
PLACE Oak Ridge, Tennessee
DATE November 19, 1982
PAGES 4620 - 4946

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

- - -

ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of	x
UNITED STATES DEPARTMENT OF ENERGY	x
PROJECT MANAGEMENT CORPORATION	x
	x Docket No. 50-537
TENNESSEE VALLEY AUTHORITY	x
(Clinch River Breeder Reactor Plant)	x
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Hemlock Room
Executive Seminar Center Building
301 Broadway
Oak Ridge, Tennessee
Friday, November 19, 1982

The hearing in the above-entitled matter was convened pursuant to adjournment, at 8:00 a.m.

BEFORE:

MARSHALL E. MILLER, Chairman
GUSTAVE E. LINENBERGER, JR., Member
CADET HAND, Member

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C O N T E N T S

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<u>WITNESSES</u>	<u>DIRECT</u>	<u>VOIR DIRE</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RE CROSS</u>	<u>BOARD EXAM.</u>
LAWRENCE J. KRIPPS						
By Mr. Edgar	4626					
By Mr. Tousley		4627				
By Mr. Tousley			4629			
By Mr. Mizuno			4724			
By Judge Linenberger						4731
CHARLES FERRELL, HOMER LOWENBERG, LEONARD SOFFER, IRWIN SPICKLER -and- PAUL LEECH (A Panel)						
By Mr. Mizuno	4754					
By Mr. Tousley			4765			
By Mr. Mizuno				4845		
By Mr. Tousley					4851	
By Judge Hand						4852
By Judge Linenberger						4859

E X H I B I T S

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Applicants':

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Staff's:

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P R O C E E D I N G S

8:00 a.m.

JUDGE MILLER: Are you ready to go?

MR. EDGAR: Applicants call to the witness stand Mr. Lawrence J. Kripps and ask that he be sworn.

JUDGE MILLER: A panel of one?

MR. EDGAR: Yes.

Whereupon,

LAWRENCE J. KRIPPS

was called as a witness by and on behalf of the Applicants and, having been first duly sworn, was examined and testified as follows:

JUDGE MILLER: Thank you. Be seated.

MR. EDGAR: Judge Miller, we've handed out copies of Applicants' direct testimony concerning Intervenors' Contentions 5(a) and 7(c) dated November 1, 1982.

I would ask that that be marked for identification as Applicants' Exhibit 45.

JUDGE MILLER: So marked.

(Applicants' Exhibit No. 45 was marked for identification.)

MR. EDGAR: I'd note for the record that we have already introduced the Environmental Report, which is already in evidence -- Applicants' Exhibits 34 through

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1 38.

2 In addition, for the convenience of the
3 parties, we have handed out a blue binder, a blue plastic
4 three-ring binder, which has the sections of the Environ-
5 mental Report which are referenced and apply to this
6 testimony.

7 JUDGE MILLER: Right. Thank you.

8 MR. EDGAR: We do not have a glossary on this
9 area of testimony.

10 JUDGE MILLER: We'll struggle on our own
11 or else improvise perhaps.

12 MR. EDGAR: We might just ask Mr. Kripps
13 when he hits an acronym or a word that's not in common
14 usage to define it.

15 JUDGE MILLER: Okay.

16 MR. EDGAR: The Applicants make a proffer of
17 Mr. Kripps' expertise as follows. His statement of
18 qualifications is set forth at Pages 17 through 18 of
19 Applicants' Exhibit 45.

20 We're proffering Mr. Kripps as an expert in
21 alternative siting analysis.

22 DIRECT EXAMINATION

23 BY MR. EDGAR:

24 Q Mr. Kripps, several questions: First of all,
25 do you have any corrections to make to your testimony at

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1 this time?

2 A. No.

3 Q. Secondly, are the opinions expressed in your
4 testimony your own?

5 A. Yes.

6 Q. And are the statements and opinions reflected
7 in the testimony true and correct to the best of your
8 information and belief?

9 A. Yes.

10 Q. And do you adopt Applicants' Exhibit 45 as
11 your testimony in this proceeding?

12 A. Yes.

13 MR. EDGAR: Judge Miller, the witness is
14 available for cross-examination.

15 JUDGE MILLER: Cross-examination.

16 MR. TOUSLEY: We have a few questions on
17 voir dire.

18 JUDGE MILLER: All right.

19 VOIR DIRE

20 BY MR. TOUSLEY

21 Q. Mr. Kripps, do you have any formal education
22 or training in population or demographics?

23 A. If by formal education, you're referring to a
24 specific piece of course work at a university which
25 related specifically to population, no.

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1 Q Have you had any formal education or training
2 in meteorology?

3 A Yes.

4 Q What was that, just briefly?

5 A I have taken several university courses in
6 climatology and meteorology.

7 Q How about biology, aquatic ecology?

8 MR. EDGAR: Which is it? I'll object to the
9 question.

10 MR. TOUSLEY: Aquatic ecology.

11 THE WITNESS: Again, with the understanding
12 that you're referring to a formal college course which
13 specifically talked about aquatic biology, no.

14 BY MR. TOUSLEY:

15 Q In biology?

16 A I have taken several biology courses.

17 Q Have you had any formal education or training
18 on socioeconomics?

19 A Again, with the understanding that you're
20 referring to a formal university type course that
21 specifically deals with socioeconomics, no.

22 MR. TOUSLEY: That concludes my questions on
23 voir dire.

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CROSS-EXAMINATION

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BY MR. TOUSLEY:

Q Mr. Kripps, in doing your alternative siting analysis, referring particularly to data on population and meteorology, did you rely on data that was provided to you by the Applicants?

A I'm somewhat confused. As indicated in my resume, at the time at which I conducted the analyses back in the early and mid-seventies, I was a member of the Tennessee Valley Authority and hence, I was a member of the Applicant.

Q Yes, I understand.

Were you responsible for generating these data, or were they provided to you by others in the project?

MR. EDGAR: Which data?

MR. TOUSLEY: Population of meteorology.

THE WITNESS: In certain cases, I was responsible for directing the effort of Applicants' contractors to obtain that data. In other cases, I obtained the data from a number of various sources.

BY MR. TOUSLEY:

Q Did you independently evaluate the accuracy of the meteorology and population data which you used in your analysis?

A In terms of the X/Q values, which I used at

1 the Clinch River site, I would say yes, that I have taken
2 an independent look at how those numbers were calculated.
3 For X/Q values for the other alternative sites, I have
4 basically relied on referenced X/Q values which have
5 been published in other documents.

6 Q And you did not independently assess the
7 accuracy of those data on the alternative sites?

8 A No, I did not do an independent assessment
9 of the accuracy of those X/Q data.

10 Q And how about population data for the various
11 sites?

12 A For the population data, I would answer that
13 again I did not do an independent analysis from which that
14 data came. I relied on the referenced sources.

15 Q In the meteorological assessments, is it
16 correct that the X/Q values, which were used for each
17 of the sites, were for one year?

18 A No.

19 Q It's not? Could you tell me how that did
20 work?

21 A If you're referring to the data base upon
22 which the X/Q values were calculated --

23 Q Yes.

24 A -- at the Clinch River site, the numbers
25 which presently appear in Appendix F, the updated section

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on the alternative DOE sites, those X/Q's as documented in Section 2.3 of the Applicants' PSAR, were generated on one year of data.

However, the X/Q values at -- for instance, Idaho, Savannah River and Hanford site, in many cases were based on many up to 10 or 15 years of data.

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1 BY MR. TOUSLEY:

2 Q Maybe I've misunderstood you. You said for
3 the TVA sites it was one year. For the DOE sites it was
4 more.

5 A No.

6 Q All right. Well, correct me then. You said --
7 For which sites was there just one year of data?

8 A Quantitative X/Q values were compared only
9 in the assessment -- in the document, in the ER -- only
10 in the assessment of Clinch River versus the alternative
11 DOE sites.

12 The X/Q values -- I believe the correct
13 reference is Table 1 in Appendix F is where they appear.
14 The X/Q values listed there are the same as those which
15 appear in Section 2.3 of the Applicants' PSAR, which are
16 based on one year of data.

17 The other referenced X/Q values in that Table
18 1 in Appendix F are based on references which are pro-
19 vided in that table. The data base for those calculations
20 were more than one year of data.

21 Q Okay. I believe Table 1 in Appendix F has
22 to do with the costs of delay.

23 A Okay. Let me double check that for you.

24 I'm referring to Table 1, which appears on
25 Page F-6. That's Appendix F, Page 6.

1 It's a comparison of site characteristics
2 between Clinch River, Hanford, Idaho and Savannah River.

3 Q Okay. Pardon me. I was in Appendix E.

4 MR. EDGAR: The correct reference is Appendix
5 F, though. That's agreed?

6 THE WITNESS: Yes, sir. Table 1, Appendix F
7 for the Applicants' Environmental Report.

8 JUDGE LINENBERGER: Excuse me, Mr. Tousley.
9 But we're going to have a lot of discussion this morning
10 that will involve this term that you're using, X/Q.

11 May I ask you, Mr. Kripps, just to define
12 that term. What do the two letters mean? What are the
13 units and the -- just a little bit about the phenomeno-
14 logical significance of that term?

15 THE WITNESS: Okay. X/Q is basically a
16 quantitative representation of atmospheric dispersion.

17 The X refers to meteorological type parameters.
18 The Q refers to a source term which will be provided in,
19 for instance, curies per second.

20 The units of X/Q are -- let's see -- seconds
21 per meter cubed, such that when you multiply X/Q, in
22 terms of seconds per meter cubed times the source term,
23 for instance, if you were to postulate that you were
24 releasing X numbers of curies per second at the plant
25 and multiplying that release of curies per second times

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1 this X/Q value, you've calculated the specific off-site
2 distance, what the concentration is in terms of curies
3 per meter cubed. All right.

4 X/Q's are basically directionally and distance-
5 dependent, so that if I wanted -- for instance -- to
6 calculate, using, say, a site-suitability source term at
7 Clinch River, and I knew what that release was in terms
8 of curies per second, and I knew what the X/Q value was
9 at, say, the low population distance of 2.5 miles, I would
10 take my site suitability source term release in curies
11 per second, multiply it times that X/Q at the low
12 population distance, and I would come up with a concentra-
13 tion of that activity in terms of curies per meter
14 cubed at that low population distance.

15 JUDGE LINENBERGER: Well, now just one more
16 question: Is the value of X/Q that you use at any specific
17 distance based on an empirical measurement of some sort?

18 THE WITNESS: The data base to calculate
19 X/Q's basically is -- in terms of Clinch River it's an
20 on-site program. By measuring things like wind speed
21 and wind direction and atmospheric stability -- that is,
22 change of temperature with elevation, those are the
23 parameters which are fed into a Gaussian diffusion model
24 in the equations and what ~~not~~ are set forth in various of the
25 reg guides, to do the computation to come up with that

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1 number.

2 JUDGE LINENBERGER: All right. Thank you.

3 Forgive the interruption, sir.

4 MR. TOUSLEY: It was helpful.

5 MR. EDGAR: Could I ask a clarifying question
6 just for the record.7 Chi is the Greek letter chi; is that
8 correct?9 THE WITNESS: Yes. It's the one that looks
10 like a capital X with a couple of squiggles on it.

11 BY MR. TOUSLEY:

12 Q Mr. Kripps, if population density were the
13 sole siting criteria -- this is a hypothetical obviously --
14 would the site with the lowest population density be the
15 preferred site for a nuclear power plant?

16 A No.

17 Q Mr. Kripps, did you participate in the answers
18 to interrogatories which Applicants provided to the
19 Intervenors in this proceeding?20 A I participated some. I was responsible for
21 those. I think, if you'll look through them, I sign --
22 I was required to sign an affidavit that particularly
23 indicated the ones I did.

24 I did some.

25 Q There was a set of interrogatories which the

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1 Applicants -- it was the Updated Response to Intervenors
2 12th Set of Interrogatories. The Response was filed
3 by the Applicants April 20, 1982.

4 At the end of that there is attached your
5 affidavit. Are you responsible for the answers on
6 meteorological questions?

7 A I was responsible for the revised --

8 Q I mean population. I'm sorry.

9 A I was responsible for the revised responses
10 to the 12th set of interrogatories, yes.

11 Q I direct your attention to Page 6, the last
12 paragraph, the first sentence. Could you look at that
13 sentence, please, and read it to us.

14 A The sentence says -- Well, first of all --

15 Q Read it first, and then you can explain.
16 Please.

17 A Let me first read what the question was,
18 so you can get some context from which the answer --

19 JUDGE MILLER: Well, just answer his question.
20 What's your question?

21 MR. TOUSLEY: I asked him to read the first
22 sentence.

23 JUDGE MILLER: On what page?

24 MR. TOUSLEY: On Page 6.

25 JUDGE MILLER: The first sentence on Page 6.

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All right.

MR. TOUSLEY: The final paragraph of Page 6. The first sentence, Updated Answers to Intervenors 12th Set.

JUDGE MILLER: Okay. Have you located the portion he asked you to read?

THE WITNESS: Yes.

JUDGE MILLER: Fine. Read it.

THE WITNESS: "With regard to population density, if it were the sole" -- "sole" being underlined -- "siting criteria for the LMFBR demonstration plant, it would be true that the site with the lowest population density would be the preferred site."

MR. TOUSLEY: Thank you.

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ged
1 BY MR. TOUSLEY:

2 Q Turning to your testimony, at the bottom of
3 Page 9 of your testimony, you state that, "the Hanford,
4 Savannah River, and INEL --" that's I-N-E-L "-- sites
5 have 'somewhat more favorable' atmospheric dispersion and
6 site isolation...characteristics than the Clinch River
7 site."

8 How do you define "somewhat more favorable"?

9 A "Somewhat more favorable" refers to the
10 judgment which I reached in comparing the X/Q values,
11 again back in that one table in Appendix F, the judgment
12 I reached comparing the X/Q values and the various
13 population density in absolute numbers between the sites.

14 "Somewhat more favorable" refers to the fact
15 that the X/Q values at the Savannah River, INEL and
16 Hanford site were somewhat smaller than those at Clinch
17 River, and also, that the population numbers were somewhat
18 smaller than at Clinch River.

19 Based on that comparison, I made the judgment
20 that these two factors were somewhat more favorable at
21 these three sites in comparison with Clinch River.

22 Q Can you put any quantitative bounds by what
23 you mean by "somewhat more favorable"?

24 A No.

25 Q You said there was somewhat smaller population

2-2 1 in the X/Q values. Can you put any quantitative bounds
2 on that?

3 A. I don't understand the question.

4 Q. Strike the question.

5 So you concluded individually that both the
6 meteorological and the population factors for those three
7 sites were somewhat more favorable?

8 A. Yes.

9 Q. And did you consider those two factors
10 together for the three sites?

11 A. Yes.

12 Q. And was your conclusion that considered
13 together, that is, both population and meteorology, those
14 sites, you describe as "somewhat more favorable"?

15 MR. EDGAR: Objection. That's cumulative and
16 redundant. The written testimony says that and all
17 questions leading up to it.

18 JUDGE MILLER: That's true, but it's not
19 hurting you much, is it?

20 MR. EDGAR: If that were the criterion for
21 my objections, I guess I wouldn't make any.

22 JUDGE MILLER: Proceed. It's early in the
23 morning. You are entitled to warm up.

24 (Laughter.)

25 JUDGE MILLER: However, it would be well to

1 move on just a bit.

2 JUDGE LINENBERGER: Mr. Kripps, let me ask
3 a question here for my own edification.

4 With respect to this same terminology that
5 Counsel has been questioning you on, if you found for
6 one site a X/Q value that was a factor of 5 more
7 favorable than another site, would that qualify for your
8 terminology as somewhat more favorable?

9 THE WITNESS: Yes, sir. If one was to take
10 a look at the X/Q values, which are in that Table 1, you
11 will see looking at the 5 percent conservative values
12 which are listed in that table the maximum difference,
13 for instance, of Savannah River or Hanford, in comparison.

14 It says that the X/Q's at Hanford or
15 Savannah River at the various distances and times listed
16 there are about a factor of four to five less at those
17 sites; and hence, that's -- yes, I would say yes to your
18 answer.

19 JUDGE LINENBERGER: Thank you.

20 MR. TOUSLEY: Thank you for anticipating a
21 question, Judge Linenberger.

22 BY MR. TOUSLEY:

23 Q That was answered for X/Q values. Would you
24 say that population densities which range from a factor
25 of 5 to a factor of 2 less than those at Clinch River

2-4 1 qualify as somewhat more favorable?

2 A. Yes.

3 Q. On Page 10 of your testimony in the second
4 sentence, you conclude that if the breeder were relocated
5 to a DOE site, one of these three we are discussing, the
6 program timing objective of construction and operation of
7 the breeder, "as expeditiously as possible," could not
8 be met.

9 Can you tell me, please, how you determine
10 whether that objective is met or not?

11 A. The timing objective is fairly extensively
12 discussed in the Applicants' Appendix E, and also again
13 updated in Appendix F.

14 As one can see reading that, we did an
15 estimation of the delay in the construction and operation
16 of the FMFBR demonstration plant were it to be relocated
17 from the present Clinch River site to one of these three
18 DOE sites.

19 The estimations that we came up with,
20 assuming an optimistic look at the different items which
21 would have to be accomplished, we came up with a delay of
22 43 months.

23 We did a second, even more conservative,
24 calculation, which we referred to as really a bare minimum
25 case, and came up with a delay of 33 months.

2-5 1 The judgment that relocation would not meet
2 the timing objective was a comparison of proceeding on
3 the type of schedule presently laid out for the Clinch
4 River Plant, and in comparison with that, the schedule
5 would end up being delayed somewhere between a reference
6 case of 43 months and a bare minimum case of 33 months,
7 if one were to relocate.

8 That was the basis for my conclusion that
9 the relocation would not meet that timing objective.

10 Q Okay. Your answer is that -- Is it fair to
11 characterize your answer as that a 33-month or a 43-month
12 delay would not meet it, correct?

13 A Yes.

14 Q What I asked was how do you know whether you
15 meet it or not?

16 MR. EDGAR: Is this in the absolute sense?

17 MR. TOUSLEY: Yes.

18 MR. EDGAR: Objection.

19 JUDGE MILLER: Sustained.

20 BY MR. TOUSLEY:

21 Q Would a 12-month delay meet the timing
22 objective?

23 MR. EDGAR: Objection. That's another set of
24 testimony.

25 Whether the project meets its objectives is

2-6 1 the subject of the testimony on Contention 7(a) and 7(b),
2 which is coming on in the next phase.

3 Mr. Kripps is testifying about alternative
4 sites, which is a relative comparison.

5 JUDGE MILLER: I believe that is true. This
6 is the alternative site portion.

7 You will have an opportunity in December.

8 MR. TOUSLEY: But he is using this subject to
9 reject sites. He is saying that it did not meet the
10 objective, and I want -- I'm just trying --

11 JUDGE MILLER: He said it didn't meet the
12 objective of time, and all you've come down to for this
13 purpose, which is very broad, is that a delay is a delay
14 is a delay.

15 Going beyond that, you are anticipating
16 matters that come up in December; so, therefore, it's
17 beyond the scope of this portion of the hearing.

18 So the objection is sustained.

19 JUDGE LINENBERGER: At the risk, however, of
20 treading on some objectionable territory, let me ask a
21 related question, Mr. Kripps.

22 However you might personally evaluate the
23 impact of delay on achieving objectives, it seems to me as
24 though the fact that there is any delay to be considered
25 implicitly carries with it the consideration that the

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1 alternate site analyses are being made at a time after a
 2 certain amount of time and investment had been made with
 3 respect to the reference site.

4 If we were starting from time zero on this
 5 program and looking at all sites, then I don't see how a
 6 delay factor might enter.

7 Perhaps you can explain this to me. Is it
 8 indeed the result of the fact that we are not starting at
 9 time zero to look at alternate sites that there is a
 10 delay, or am I misunderstanding something?

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2-8 1 THE WITNESS: I believe you are correct. The
2 fact that the project has proceeded since 1971 and '72 to
3 the present time in the context that the plant would be
4 built at the Applicants' proposed site, if one was to
5 transport oneself at this hearing back to 1971 or '72,
6 the timing objective, because the work hadn't been done
7 at the Clinch River site, may not be a point that would
8 be considered in the alternative siting analysis.

9 JUDGE LINENBERGER: Thank you, sir.

10 BY MR. TOUSLEY:

11 Q I'd like to direct your attention to Pages 13
12 and 14 of your testimony. In Answer 12 you state that
13 some of the TVA sites and all of the DOE sites had lower
14 population densities and more favorable dispersion
15 characteristics than the Clinch River site; is that
16 correct?

17 A Just to make sure that I answer correctly,
18 yes.

19 As we previously discussed, our findings were
20 that all the DOE sites have somewhat more favorable
21 atmospheric dispersion and population, and that depending
22 on which one -- and, also, some of the alternative
23 candidate TVA sites also possessed certain advantages in
24 terms of atmospheric dispersion and population, yes, as
25 stated in my first sentence here in the testimony.

2-9 1 Q Yes. I believe I only paraphrased your
2 first sentence in my question.

3 On Page 15 you state that these factors
4 alone don't make those sites environmentally preferable,
5 and that on consideration of all pertinent environmental
6 siting factors, none of them are environmentally
7 preferable to the Clinch River site; is that correct?

8 A That is what is stated on Page 15 of the
9 testimony. Yes, sir.

10 Q All right. This suggests that for some of
11 the factors, other than population and meteorology, the
12 DOE sites were deemed less desirable than Clinch River;
13 is that a correct inference?

14 A Not necessarily.

15 Q What offsets the more favorable population and
16 meteorology at those sites to yield an over-all assessment
17 that they are not environmentally preferable?

18 A There is a point of confusion here. The
19 statement in the testimony -- let me make sure I get to
20 it here -- is that while we have made the conclusion that
21 atmospheric dispersion and population characteristics are
22 more favorable at the three DOE sites and at some of the
23 alternative candidate TVA sites, we have stated that that
24 in and of itself would not lead to a conclusion that those
25 sites are environmentally preferable.

2-10 1 Q Fine, and my question is what added to those
2 considerations leads to the conclusion that they are not?

3 JUDGE MILLER: Why aren't they environmentally
4 preferable if they have those pluses going for them?

5 THE WITNESS: Okay. We had to take a look at --
6 the analysis took a look at comparison of X/Q's and
7 population density.

8 JUDGE MILLER: Yes, for what purpose?

9 THE WITNESS: For the purpose of identifying
10 differences which may appear between those sites.

11 JUDGE MILLER: In what respect? What kind of
12 differences were shown by that analysis?

13 THE WITNESS: Okay. Initially, we took a
14 look at the quantitative differences, and we have
15 identified that they are a factor of 4 to 5 on the X/Q's
16 and a factor of, I believe, 2 to 5 on the population
17 densities.

18 JUDGE MILLER: Which means what, now, in plain
19 English?

20 THE WITNESS: Okay. In order to assess these
21 in terms of what the impacts would be of the construction
22 and operation of an LMFBR demonstration plant, those two
23 parameters are primarily important in determining what the
24 resulting off-site doses would be from radiological
25 releases.

2-11 1 JUDGE MILLER: All right.

2 THE WITNESS: The Applicant has done analyses
3 of the impact of normal operation and also of a variety of
4 accidents at the Clinch River site, using the X/Q values
5 and the population densities surrounding Clinch River.

6 JUDGE MILLER: Which so far are less favorable
7 to Clinch River.

8 THE WITNESS: Yes.

9 JUDGE MILLER: All right. Go ahead with it.
10 Let's find out what else happened to make you come to a
11 judgment that even though those were negatives, that they
12 were overborne by whatever pluses you were putting into the
13 equation.

14 THE WITNESS: Okay. Even though the X/Q
15 values and the population density were less favorable
16 at the Clinch River site, our analysis showed that the
17 effect of that on the environmental impact due to
18 radiological releases, be they normal or accident, were
19 insignificant.

20 We have met the 10 CFR 50, Appendix I,
21 criteria for normal operation. The testimony which was
22 presented in August for Contentions 1, 2 and 3 indicated
23 that we met the site suitability source term requirements
24 in 10 CFR, Part 100.

25 JUDGE MILLER: I understand that. You are

1 saying that even though these two factors were less
2 favorable to Clinch River, that over all, your judgment
3 was that either was relatively insignificant in the
4 big picture.

5 THE WITNESS: Yes.

6 JUDGE MILLER: All right, now, what's the big
7 picture? You consistently are avoiding, probably because
8 I'm not making myself clear what I'm trying to understand.

9 You are not going to get away with showing
10 that Clinch River is less favorable and that nothing
11 else enters into it simply by saying the whole thing is
12 pretty de minimus.

13 I'm sure that's not what you are going to
14 wind up saying. So, therefore, insignificant or
15 significant or not, whatever values were put to that
16 judgment, on these two factors Clinch River is behind.

17 Now, over all, what puts it ahead, or what
18 puts the others as less favorable, or Clinch River as
19 environmentally preferable?

20 THE WITNESS: Okay. There's one point of
21 confusion. The terminology --

22 JUDGE MILLER: Well, then, enlighten me.

23 THE WITNESS: Okay. I'm sorry.

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1 WITNESS KRIPPS: I'm sorry.

2 The terms more favorable is not equated to
3 environmentally preferable. The fact is, that we concluded
4 comparing Clinch River with the DOE site, they were more
5 favorable on atmospheric dispersion population.

6 JUDGE MILLER: The DOE sites were more
7 favorable on atmospheric dispersion in population.

8 WITNESS KRIPPS: All of the other parameters
9 that we looked at, we essentially judged there would be
10 no differentiation between the sites.

11 On all the other parameters, geology,
12 hydrology, we essentially said that they could be
13 considered to be equivalent.

14 JUDGE MILLER: All right.

15 So, you've got equipoise on all other factors
16 except these two?

17 WITNESS KRIPPS: Yes.

18 JUDGE MILLER: So far, what's the score?
19 2 to 0, DOE?

20 WITNESS KRIPPS: It is not simply a ranking
21 system.

22 JUDGE MILLER: Then what was it? I'm trying to
23 find out, what did they do?

24 Now, you've got two less favorable factors.
25 Everything else comes out even. And I say, so far, it

1 looks to me on a balance, like it's 2 to 0 against Clinch
2 River.

3 Now, I know that's not what you're testifying.
4 So, I'm trying to get you now to forget the tables and
5 stuff and just sit right down now and tell us in plain
6 English and it's going to be taken down here, why a 2 to 0
7 deficit becomes, overall, an environmentally preferable
8 situation at Clinch River.

9 WITNESS KRIPPS: Because the X/Q values and
10 the population density do not manifest themselves into
11 a significant difference in terms of the environmental
12 impact at those sites.

13 JUDGE MILLER: So the pluses -- the two pluses,
14 atmospheric dispersion and population, are so slight as
15 not to be given any weight to you in determining whether
16 or not those or the DOE sites were environmentally
17 preferable to the Clinch River site?

18 WITNESS KRIPPS: Essentially, yes. They are
19 not significant enough -- particularly in the context of
20 how they are utilized in calculating environmental impact
21 and that is in terms of, really, the offsite doses, that
22 those two pluses would lead me to a judgment to make an
23 overall conclusion that those sites are environmentally
24 preferable.

25 JUDGE MILLER: It would lead you not to make

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1 such a judgment.

2 WITNESS KRIPPS: I would not make the
3 judgment that those three DOE sites are environmentally
4 preferable to Clinch River, yes.

5 JUDGE MILLER: Even though in those two factors,
6 of atmospheric dispersion and population, they are ahead
7 of Clinch River and on all other factors, if I'm following
8 you correctly, it was a draw?

9 WITNESS KRIPPS: That is correct.

10 And the real judgment there is, that although
11 there is absolute difference in the numbers, that when
12 those numbers -- the way those numbers are important in
13 terms of assessing the environmental impact, is it in
14 terms of the radiological doses from releases at the
15 plant, be they accidents or normal operations.

16 What I'm saying is, that at Clinch River, the
17 analysis we've done at Clinch River, even with those less
18 favorable parameters, we have shown that the environmental
19 impact is insignificant, not important.

20 JUDGE MILLER: So the pluses are insignificant
21 and everything else is a draw, why don't you wind up, then,
22 with a draw overall?

23 WITNESS KRIPPS: That is essentially what I
24 would conclude, that from an environmental standpoint --

25 JUDGE MILLER: Then how do you conclude that the

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1 Clinch River is environmentally preferable? It's a tie,
2 if I'm following your analysis correctly.

3 I'm beginning to wonder if I am.

4 MR. EDGAR: Mr. Chairman, he does not conclude
5 that Clinch River is environmentally preferable.

6 In his testimony he says that the other sites
7 are not environmentally preferable, which is consistent
8 with a draw.

9 JUDGE MILLER: That's what I'm inquiring.

10 I'm going to ask in a moment now -- I'm going
11 to ask you and all other Counsel to tell us what you
12 consider to be the standards that are to be applied as a
13 result of the Commission's decision a few years ago,
14 because I think that's what really laid out the standards
15 we are to use in judging alternatives.

16 I guess we'll start with you, Mr. Edgar,
17 because this is your witness.

18 MR. EDGAR: Well, the standard to be applied
19 is set forth in the Commission's August 1976 decision.

20 The inquiry should evaluate alternatives in
21 terms of their ability to meet programatic objectives --

22 JUDGE MILLER: Taken as given, I believe.

23 MR. EDGAR: Correct.

24 -- for the project.

25 Secondly, the standard which would be applied

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1 is governed by rule of reason that in evaluating the
2 alternative, the ultimate test is whether the particular
3 alternative is a substantially better.

4 JUDGE MILLER: Was that the term used?

5 MR. EDGAR: Yes, sir.

6 JUDGE MILLER: "Substantially better"?

7 MR. EDGAR: And I'll go on and just -- there
8 are two additional subsequent -- excuse me. I'm sorry.

9 JUDGE MILLER: No, that's all right. Go ahead.

10 MR. EDGAR: -- two additional subsequent
11 points that I'll factor in here but the substantially
12 better test is --

13 JUDGE MILLER: That preceded the "obvious
14 superiority" or whatever came up at Seabrook; didn't it?
15 And might have been a progenitor of it.

16 MR. EDGAR: Yes, sir, and I was going to
17 address that very briefly in a moment.

18 So, what we want to look at is the question
19 of substantially better alternatives for satisfying
20 project objectives.

21 All right.

22 That's our basic test.

23 It should be recognized, however, that as a
24 matter of prudence, the Applicants also utilized analyses
25 which were based on the NRC proposed rule on alternative

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1 siting. That proposed rule sets of a formalism which is
2 not inconsistent with the governing test but which is
3 slightly different in the way it approached the problem
4 and the best way to describe the proposed rule is what I
5 would call a two-level analysis.

6 The first thing you look at is, you go through
7 and categorize sites in terms of representative
8 environmental classifications.

9 The proposed rule contemplates that when you
10 do an alternative siting analysis, that you get
11 "environmental diversity". So you pick a site as a
12 candidate which is at the headwaters of a large river.

13 You pick one that is in midstream of a small
14 river.

15 You pick one on hilly country, on flat country.
16 There's a nifty word they use. Physiographic units and
17 please don't press me on that one.

18 But, in any event, you select your candidates
19 so you describe environmental diversity.

20 Then you go through an analysis on Level 1,
21 which is just environmental factors and you lay out a
22 matrix and you ask the question, is one site environmentally
23 preferable to another.

24 If the answer is no, within reasonable limits
25 of judgment and based on what the rule calls

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1 "reconnaissance level information", that would be, for
2 example, you go and pick out the information from the
3 PSAR from another plant, and if the answer is no in Level 1,
4 then you stop the analysis.

5 If the answer is yes or maybe in Level 1,
6 or if you want to perform an overcheck, you go to Level 2.
7 Then you bring in the additional factors. Institutional.
8 Economic. Et cetera. Programatic. Whatever they may be.

9 And in that Level 2 analysis, you balance off
10 whatever your equation was on preferability against the
11 other factors and reach an ultimate judgment as to whether
12 alternatives are obviously superior or not.

13 All right.

14 Now, if there is confusion, it may be that
15 if you go back to the core analysis that the Applicants
16 have conducted, what we have done is applied the test which
17 is governing under the August '76 decision. That is
18 substantially better.

19 That involves a mix of factors. Environmental.
20 Economic. Programatic.

21 We have also, for the purpose of checking the
22 answer, used the formalism of the proposed alternative
23 siting analysis rule.

24 That's where the rubric "preferability" comes
25 in and you apply the test, "is another site environmentally

1 preferable to Clinch River"? And then, if the answer is
2 no, you could end the analysis.

3 We, in addition, went beyond that and
4 evaluated it on Level 2.

5 So, we think, under any test that can be
6 described, and we submit that the controlling one is
7 "substantially better", that this project passes the test
8 under "substnationally better".

9 We have also done analysis to demonstrate that
10 it passes it under the formalism or -- I don't know
11 whether I'm using the physicists' term -- but the
12 methodology of the proposed rule.

13 JUDGE MILLER: Mr. Tousley, I'd like to hear
14 from you on this.

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4-1 1 JUDGE MILLER: And we will the Staff, too.

2 MR. TOUSLEY: As far as the law is concerned --
3 well, the proposed rule on alternative sites that Mr.
4 Edgar spoke about, one minor correction. Other than
5 speaking of programmatic factors in the second stage of
6 the test, as he mentioned, the factors it lists are
7 economics, technology and institutional factors.

8 JUDGE MILLER: Well, how would you translate
9 that into this particular matter where the Commission
10 has acted and we're taking as givens the information
11 on needs and the like, which are different -- if not
12 significantly differently from the light water reactor
13 alternative siting which you're referring to.

14 In other words, tailor that to this, if you
15 would, please.

16 MR. TOUSLEY: Yes. I have some question as
17 to the status of this proposed rule, which is the frame-
18 work for this --

19 JUDGE MILLER: Well, then start with a sub-
20 stantially better rule that was enunciated by the Commis-
21 sion in this case; and that was dealing specifically with
22 the breeder reactor and so forth.

23 So maybe if you question the other --
24 Maybe you should at least give us your interpretation of
25 the substantially better rule and whatever ramifications

1 stem from it, since we know that that applies to Clinch
2 River.

3 MR. TOUSLEY: Yes. My interpretation is that
4 the substantially better criterion which the Commission
5 set out in '76 is basically the same. That's the ob-
6 viously superior criterion in the proposed rule.

7 The Commission in '76 did not want the Clinch
8 River site to be rejected on account of another site
9 which was only slightly better.

10 This proposed rule amounts to the same
11 thing. There have to be substantial differences. One
12 of the alternatives should -- has -- To me "substantially
13 better" means about the same thing as "obviously superior."

14 JUDGE MILLER: Yes. But since that give you
15 a problem, I was going to eliminate the intellectual
16 problem for you.

17 You don't have to equate the two to consider --
18 Make your analysis on this case where the Commission has
19 spoken, and we know that that's foursquare with the
20 breeder question.

21 That we know because it's the same case, and
22 it's the law of the case. So explicate for me the law
23 of the case then, and we won't worry about other problems
24 that we might have in interpreting something else.

25 MR. TOUSLEY: Well, obviously the

1 "substantially better" test is controlling here. We think
2 that the kinds of differences that we've been discussing
3 in the testimony here today amount to "substantially
4 better" in some cases.

5 That will be the arguments that we make in
6 this case.

7 If you take the population and meteorological
8 differences that Mr. Kripps has testified to and consider
9 them together, you can come up for some sites -- for
10 instance, the Idaho site -- with a factor of 25 reduction
11 in the radiological risk.

12 The Applicants themselves in Appendix F of
13 the Environmental Report at one point mentioned that
14 the consequences of accidents at the DOE sites would be
15 approximately a factor of 50 less than the Clinch River.

16 We --

17 JUDGE MILLER: Consequences of accidents in
18 terms of the two factors: atmospheric dispersion and
19 population?

20 MR. TOUSLEY: Yes.

21 JUDGE MILLER: That you've been examining --

22 MR. TOUSLEY: Yes.

23 JUDGE MILLER: Well, then why -- It would
24 seem to me that this would be the kind of questioning to
25 be putting to the witness because I didn't quite understand

1 what standards he was using. I do now, both from his
2 explantion and asking for an exposition of the law, and
3 I'm going to get an exposition of the law from all
4 counsel.

5 But then there would seem to me that now there
6 is clearly delineated the differences from the standpoint
7 of legal significance. I would think that that's where
8 you would zero in, because that is where there is or
9 is not a going controversy between your theory of the
10 case and that of the Applicants on this particular
11 issue.

12 MR. TOUSLEY: Well, Mr. Chairman, the Com-
13 mission -- Neither the Commission nor the proposed rule
14 quantifies what it means by "substantially better" or
15 "obviously superior."

16 JUDGE MILLER: They only use the term
17 "substantially better."

18 MR. TOUSLEY: The Commission --

19 JUDGE MILLER: My memory of that decision --
20 I haven't read it for a year -- but I studied it quite
21 carefully at the time, and later I became aware of the
22 "obviously superior," and so it evolved in a different
23 context.

24 So I don't want to confuse these concepts
25 now. Okay.

1 MR. TOUSLEY: Okay.

2 JUDGE MILLER: Do you agree that what we're
3 looking at is and is only the standard that the Commission
4 has described -- even if imperfectly or superficially,
5 however you may want to view it -- of "substantially
6 better," in looking at alternative sites under NEPA.

7 Do you agree that that is the standard here?

8 MR. TOUSLEY: Is the implication of that that
9 the proposed rule is not operative here at all?

10 JUDGE MILLER: That might well be. I don't
11 know.

12 But if I don't have to get into the proposed
13 rule, why should I worry myself? If I can go with what
14 the Commission said in this case, I know it's applicable.
15 I don't have to worry about whether it may or may not be,
16 and then get into differences and controversies among
17 counsel on that which might be.

18 I stick to the direct, the here and now.

19 MR. TOUSLEY: Yes --

20 JUDGE MILLER: Okay.

21 MR. TOUSLEY: The implication is, of course,
22 that both the Applicants and the Staff have tailored their
23 analyses to the proposed rule.

24 JUDGE MILLER: This may well be.

25 MR. EDGAR: Well, that's --

1 JUDGE MILLER: That's not decisive nor
2 dispositive, if I understand correctly. The Applicants
3 at least are proffering their ultimate conclusions under
4 both theories.

5 Since I'm primarily concerned with one that
6 I know is foursquare applicable, then I'm suggesting --
7 and I'm not being critical of you at all -- I'm only say-
8 ing that I now understand where the significant dif-
9 ferences lie from a legal point of view, translated into
10 what the testimony is that you're going to be testing on
11 cross-examination.

12 I want to be sure I understand fully now your
13 legal theory, and I think I do.

14 MR. TOUSLEY: May I have just a moment to con-
15 sult?

16 JUDGE MILLER: Yes.

17 (Pause.)'

18 JUDGE MILLER: Ready?

19 MR. TOUSLEY: Yes.

20 Mr. Chairman, we don't disagree with the under-
21 standing you've expressed about the prevalence of the
22 Commission's "substantially better" standard. We feel it
23 would be useful at times during the interrogation on the
24 subjects today to use some of the terminology in the pro-
25 posed rule.

1 JUDGE MILLER: We don't mind. We have no ob-
2 jection to it.

3 MR. TOUSLEY: Fine.

4 JUDGE MILLER: But simply that we don't want
5 to confuse our own use of terms, and we wanted to tell
6 you what the Board's understanding of the tests that it's
7 going to apply in this case.

8 And, of course, you're free to go into areas
9 you deem are significant or helpful in that regard, but not
10 because you're going to tell us it's a different rule,
11 because you say that it has a significant bearing upon
12 the "substantially better" test, okay?

13 MR. TOUSLEY: Fine. Understood.

14 JUDGE MILLER: Now I want to hear from the
15 Staff on this.

16 MR. MIZUNO: Well, the Staff agrees with the
17 Applicants concerning the standards set by the Commission.

18 May I read that into the record?

19 JUDGE MILLER: Yes, you may.

20 MR. MIZUNO: This is from the Commission's
21 1976 order, CLI 76-13, dated August 27, 1976.

22 On Page 92 of that particular NRC issuance,
23 under the numeral three, the Commission said, "In con-
24 sidering alternatives, including non-TVA siting alter-
25 natives in the present proceeding, the following general

1 principles should be observed: Consideration of alter-
 2 natives need go no further than to establish whether or
 3 not substantially better alternatives are likely to be
 4 available."

5 The --

6 JUDGE MILLER: " ... whether or not sub-
 7 stantially better alternatives are likely to be available."
 8 Is that the language?

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1 MR. MIZUNO: Yes.

2 JUDGE MILLER: All right. That's, I think,
3 what the Board is talking about and counsel addressed.

4 MR. MIZUNO: Second of all, the Staff did use
5 the applicable standard as set forth in the Commission
6 in coming to its conclusions in the FES.

7 Specifically, I would point to the Final FES
8 Supplement, Chapter 9, Page 9.9, where the Staff con-
9 cludes that "No alternative TVA site is substantially
10 better than the proposed site for the LMBFR demonstration
11 plant."

12 And also on Page 9-11, where the Staff also
13 found, "that Staff did not find any of these DOE candidate
14 sites to be substantially better than the Clinch River
15 site for the LMBFR demonstration plant."

16 JUDGE MILLER: So the Staff did then use
17 that Commission-enunciated test?

18 MR. MIZUNO: Yes. The Staff did use that
19 legal standard set forth by the Commission.

20 JUDGE MILLER: Do you have anything further
21 to --

22 MR. MIZUNO: Yes. Just a point of -- for the
23 Board's help. If they wanted to look at the text of the
24 proposed rule, the rule is contained in Appendix K of
25 Volume II of the FES Supplement -- the final 1982 FES

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1 Supplement.

2 JUDGE MILLER: Let me be clear: You're not
3 contending that the final rule --

4 MR. MIZUNO: The proposed rule.

5 JUDGE MILLER: Yes.

6 -- that the proposed rule, namely, alters
7 or modifies the test standards set up by the Commission
8 in its decision of 1976?

9 MR. MIZUNO: Not at all; not at all.

10 JUDGE MILLER: Okay. Very well. I think --

11 MR. EDGAR: I think -- maybe for the record,
12 just in the same portion of the decision, at Page 92,
13 there's useful language again for guidance under the
14 item enumerated three, and I quote: "Alternatives for
15 meeting the objectives are relevant to this proceeding
16 and are to be evaluated in terms of the objectives defined
17 in the ERDA Impact Statement."

18 It just gives you a frame of reference for
19 evaluating alternatives. Then it goes on --

20 JUDGE MILLER: Does that include alternative
21 design to meet the informational needs taken as given?

22 MR. EDGAR: That's correct.

23 JUDGE MILLER: Essentially, you've got two
24 alternative matters then, haven't you: the need for the
25 site alternatives and the --

1 MR. EDGAR: The design.

2 JUDGE MILLER: Yes. Design alternatives,
3 which we're not going into at this time, I assume.

4 MR. EDGAR: That's currently scheduled as
5 the second issue in the next phase of hearings. We'll
6 have testimony on that subject.

7 JUDGE MILLER: Very well. All right.

8 Sorry we took the time, but it's helpful to the
9 Board at least to see what the ground rules are.

10 Now you may proceed with your cross-
11 examination, Mr. Tousley.

12 BY MR. TOUSLEY:

13 Q Mr. Kripps, I'd like to direct your attention
14 to Appendix F of the Environmental Report, Page F-33.

15 A Yes, sir.

16 MR. TOUSLEY: For the Board's purposes, that's
17 in these blue notebooks that Applicants passed out.

18 JUDGE MILLER: Do you have the page in the
19 blue notebook?

20 MR. TOUSLEY: Yes. It's Page F-33, Appendix
21 F.

22 JUDGE MILLER: We have it. Thank you.

23 BY MR. TOUSLEY:

24 Q In the initial paragraph, about the middle of
25 the paragraph, you state that "The thick, more favorable

4-12
1 atmospheric dispersion characteristics and population dis-
2 tribution at Hanford, Savannah River or INEL reduced the
3 consequences of design basis accidents by a factor of 50."

4 Is that correct?

5 JUDGE MILLER: "Approximately."

6 MR. TOUSLEY: "Approximately a factor of 50."

7 BY MR. TOUSLEY:

8 Q Is that correct?

9 A That's what's stated there. I guess I'd like
10 to add that since we put this thing together, we've taken
11 a look at -- a little bit harder at the combination of
12 the effect of X/Q's and population. Fifty is certainly a
13 conservative bound.

14 It's more probably like in the likelihood of
15 20 to 25, somewhere thereabout. But 50 we could use
16 for the purposes here.

17 Q Can you tell me how the factor of 50 was
18 derived? Was this -- I'll be a little more specific.

19 I'd like to know if this was derived by
20 multiplying population density figures by the meteorology
21 figures. Or were other considerations added in?

22 A It strictly consisted of a consideration of
23 population and X/Q numbers. It is a multiplicative
24 process. But it is a function of the population distri-
25 bution and also a function of the X/Q's as they change

1 with distances and directions.

2 It's a more difficult calculation than just
3 taking the numbers in Table 1 and doing a multiplication.
4 Those were the only two factors considered in that cal-
5 culation.

6 Q Was the factor of breathing rate considered
7 in deriving that?

8 A No --

9 JUDGE MILLER: The factor of what?

10 MR. TOUSLEY: Breathing rate.

11 THE WITNESS: Not in the factor of 50, no,
12 sir.

13 BY MR. TOUSLEY:

14 Q Is it correct that the breathing rate might
15 be different for the different time periods considered
16 in the X/Q numbers, and that an accurate use of those
17 might weight them according to the breathing rate?

18 A I'm confused. Breathing rate has nothing
19 to do with the calculation of the factor of 50. The
20 way that the assessment was done was essentially to
21 postulate a release of activity at a site. And for the
22 purposes of this analysis, we considered that everything
23 was equivalent at the different sites, except population
24 and atmospheric dispersion.

25 Hence, the only difference in this assessment

1 presented here, in terms of the differences between the
2 sites, is in those two terms.

3 Q Okay.

4 JUDGE MILLER: Pardon me now when you reach a
5 stopping point.

6 Are you through with your answer?

7 THE WITNESS: Yes.

8 JUDGE MILLER: I want to ask if this term
9 "breathing rate," which may be self-defining, is not
10 necessarily recognized by all of us as a term of art.
11 So I'd like to have it defined in the sense of which either
12 or both of you are using it.

13 MR. TOUSLEY: Well, my understanding is
14 that -- we're talking about -- these X/Q numbers are
15 given for different periods of time, zero --

16 JUDGE MILLER: I just mean the term "breathing
17 rate." What is that?

18 MR. TOUSLEY: The rate at which human beings
19 breathe air. And this differs with time. Over periods
20 of time, when people sleep they breathe much more slowly
21 than when they're exercising.

22 JUDGE MILLER: Older and younger, excited or
23 calm?

24 MR. TOUSLEY: Running away from an accident
25 or not.

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5-15
1 JUDGE MILLER: Now let me ask the witness.
2 He may have a little more technical definition. I don't
3 know.

4 In what sense were you using the term "breath-
5 ing rate," in this connotation?

6 THE WITNESS: In the same sense, essentially.
7 Apart from this, when one -- if one takes a release, to
8 calculate a dose to a person off-site, one has to use a
9 radiological model, insofar as if you calculate the
10 concentration of activity where a person happens to be,
11 one has to calculate -- one of the doses to that person is
12 an inhalation dose.

13 That inhalation dose is a function of how
14 much air he is breathing. That is the context, I believe.

15 Those types of breathing rates are defined
16 in the radiological models, which the Applicant has used
17 and the Staff has used, in calculating off-site doses.

18 As I've said, it has nothing to do with the
19 factor of 50. The factor of 50 is discrimination between
20 sites. We have essentially assumed the same radiological
21 model in this analysis for all of the sites.

22 The only difference in the site recognized in
23 the factor of 50 here is in the X/Q values in the popula-
24 tion distribution.

25 JUDGE LINENBERGER: To say it a little

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different way: Is it not so that the concept of breathing rate only comes in when you try to make the transition in X/Q values to dose values?

THE WITNESS: Yes, sir.

JUDGE LINENBERGER: And in this context, would things like higher altitudes of the population enter in from a dose point of view?

Does a person at high altitudes breathe --
Well --

THE WITNESS: I'm not real --

JUDGE LINENBERGER: Well, let's stay away from that because we're not -- you're not calculating doses here. You're just doing meterology. So let's stay out of that.

JUDGE MILLER: Okay, proceed.

- - -

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5-1 1 MR. TOUSLEY: The reason I asked the question
ged 2 was --

3 JUDGE MILLER: I didn't mind you asking it.
4 I just wanted to know what we were talking about. That's
5 all.

6 MR. TOUSLEY: The breathing rates are used to
7 weight the various X/Q values and it can make a difference
8 as to which values are the most significant in terms of
9 dose.

10 BY MR. TOUSLEY:

11 Q Would you disagree with that?

12 A I would not agree with that.

13 Q You would not?

14 JUDGE MILLER: He would not agree, which means
15 he would disagree.

16 MR. TOUSLEY: It sounds like it.

17 JUDGE MILLER: That's the state of the
18 record at the moment.

19 BY MR. TOUSLEY:

20 Q Well, would you tell me what's wrong with
21 that explanation?

22 A I basically did not understand your question
23 or the explanation. I didn't understand what you said.

24 JUDGE MILLER: That's a pretty basic
25 disagreement.

1 I think you better restate it so we get on the
2 same wave length and we'll go ahead.

3 BY MR. TOUSLEY:

4 Q What I said was that the breathing rates are
5 used to weight the X/Q factors for the various time periods.
6 It was done so in the site suitability analysis to come
7 up with the X/Q numbers.

8 JUDGE MILLER: Do you agree with that?

9 MR. TOUSLEY: Wait a minute.

10 JUDGE MILLER: Go ahead.

11 (Pause.)

12 MR. TOUSLEY: Okay. I have been corrected.

13 JUDGE MILLER: All right. Let's strike what
14 you said, and if you wish to state it -- I'm not requiring
15 you to.

16 If it would be helpful to your examination,
17 yes. If not, you need not --

18 MR. TOUSLEY: Well, I might as well clear it
19 up.

20 JUDGE MILLER: Okay.

21 BY MR. TOUSLEY:

22 Q To calculate the doses, the X/Q numbers are
23 multiplied by breathing rates and by dose conversion
24 factors and by population density to get dose to the
25 population, and so to get --

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1 JUDGE MILLER: Let's see if we get agreement
2 with that.

3 Have you agreed so far?

4 He is going to add some more factors, but --

5 THE WITNESS: I would like to rephrase it.

6 When one does a radiological calculation, you
7 assume you have a release in terms of curies per second
8 of activity.

9 One multiplies those by X/Q values to calculate
10 concentration of activity at various distances.

11 To calculate the dose, one takes the release
12 times the X/Q applicable to the distance and direction at
13 which that person is standing.

14 To calculate a curies per meter, a concentration
15 of activity where that person is standing, one then uses
16 the radiological dose models, which include inhalation,
17 dose conversion factors, to then compute what dose that
18 person has received at that particular point from the
19 release back at the release point.

20 JUDGE MILLER: Do you agree with that?

21 MR. TOUSLEY: Yes.

22 JUDGE MILLER: Okay, because I think you were
23 going to add some factors and wind up at the same place,
24 right?

25 All right. We are standard in our definitions

5-4

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1 now.

2 Proceed.

3 BY MR. TOUSLEY:

4 Q The significance in the context of my question
5 was that in order to compare sites, you can't just add up
6 or average the X/Q factors for the various time periods.

7 You need to consider these other things to get
8 an over-all --

9 JUDGE MILLER: Ask the witness. If you wish,
10 you may ask the witness.

11 I'm not trying to tell you what to ask.

12 BY MR. TOUSLEY:

13 Q Let me ask you this. When you came up with
14 the figure of a factor of 50 on Page F-33 of the
15 Environmental Report, which X/Q values were used for which
16 time periods?

17 Was one of them chosen or were they combined
18 in some way?

19 A The factor of 50 is a conservative rough
20 calculation.

21 The problem has to do with at Clinch River the
22 Applicant has defined what the population distribution is
23 in terms of radial segments in 16 sections. So there's
24 a bunch of little pie-shaped things out there.

25 The Applicants have the capability of

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1 calculating a X/Q value at any distance in any direction,
2 and we did so at time intervals, the standard time
3 intervals of zero to two hours, the following six hours
4 getting to eight, and then I think the numbers go to like
5 three days and six days.

6 We did it for like five increments of time.

7 In trying to calculate what the combination of
8 these two factors in terms of differences between, say,
9 Clinch River and Hanford, we did not have all the data to
10 do a precise calculation.

11 What we did was to take a look at the data
12 that's presented in Table 1 of Appendix F and see what
13 the differences were there.

14 Now, in Appendix F, those table X/Q values
15 are presented only at two distances. They are presented
16 at the exclusion boundary and the low population zone at
17 the different plants.

18 They are presented for different increments
19 of hours, zero to two, zero to eight, and here are the
20 numbers, eight to twenty-four, one to four, and four to
21 thirty days.

22 We took a look at the differences in each time
23 increment in comparison with Clinch River and picked out
24 the maximum one and assumed that that difference in X/Q
25 would exist at all of the different distances, and hence --

5-6 1 you have to take --

2 Q That answers my question, if you'd like to stop.

3 A Okay.

4 Q I believe you told the Board several minutes
5 ago that your conclusion was that this factor of 50
6 difference in the risk was not significant enough to
7 lead you to the conclusion that the DOE sites were
8 preferable to the Clinch River site; is that correct?

9 A I don't believe that's an accurate paraphrase
10 of what I said.

11 Q Well, would you please paraphrase it
12 correctly?

13 JUDGE MILLER: Why not just phrase it
14 directly? He doesn't have to paraphrase himself.

15 Let me ask you, Mr. Kripps. Look at Page
16 F-33 which you were looking at in Amendment XV.

17 While ago I asked you why the two negatives
18 from the Clinch River point of view were outweighed in
19 some fashion to cause you to arrive at a conclusion that
20 none was substantially better, or that Clinch River was
21 preferable.

22 I see that the last paragraph there on that
23 page reads as follows: "Therefore, the project, after
24 careful consideration of the cost, benefits, effectiveness
25 and risks associated with the alternative sites, believe

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1 that the reduced environmental impacts of accidents for
2 the alternative sites are still substantially outweighed
3 by the lesser costs, greater benefits, and enhanced
4 effectiveness of the demonstration and the utility
5 environment for the Clinch River site.

6 "A summary of the key reconfirmed finding is
7 illustrated on Table 9. Thus it is concluded that
8 Clinch River is the preferred site, and certainly, neither
9 Hanford, Savannah River, nor INEL represent substantially
10 better alternatives for satisfying LMFBR program information
11 goals."

12 Now, is that consistent with your testimony?

13 THE WITNESS: Yes, sir.

14 JUDGE MILLER: And that's the answer, frankly,
15 I was expecting to get when I asked you, not some "none
16 of it was significant," and the rest, which is what you
17 are being interrogated about.

18 You will be asked those questions, but I would
19 like to know now what are these alternative sites, the
20 pluses we have discussed, are substantially outweighed
21 by the lesser cost, greater benefit, and enhanced
22 effectiveness of the demonstration and utility environment.

23 What are those three factors, in your judgment,
24 from which you base the conclusion which you have on Page
25 15 in your testimony?

5-8 1 I assume you are the proper witness to ask this
2 of?

3 THE WITNESS: Yes, sir.

4 JUDGE MILLER: Okay.

5 THE WITNESS: Let me go back and take one
6 second to explain the previous conversation.

7 JUDGE MILLER: Well, don't. I've been through
8 it with you.

9 Let's go from where we are now. I've read to
10 you what I want you to tell me about.

11 Lesser cost, greater benefits, and enhanced
12 effectiveness of the demonstration and utility environment,
13 which you have stated here outweighed the two factors.

14 I've been through it and I don't want to go
15 through it again. I do want to go forward with these
16 pluses.

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1 THE WITNESS: Other than looking at
2 environmental and siting characteristics at these sites,
3 we looked at, in the context of the Commissioner's Order
4 and also in the context of the second part of the proposed
5 rule, at other factors which would differ between sites.

6 We concluded that things which would differ,
7 first of all, would be the cost of the project were it to
8 be relocated.

9 JUDGE MILLER: All right. Let's look at the
10 lesser cost, which is the first of the three counter-
11 balancing matters quoted at Page F-33.

12 What are the lesser costs of Clinch River and
13 what are the greater costs of the alternative sites,
14 including those DOE sites, which do have some advantage,
15 significant or not, of the propositions relating to
16 atmospheric dispersion and population density?

17 THE WITNESS: Our differentiation of costs for
18 the DOE sites appears in Appendix F on Page 31. There's
19 a Table 8 in which we have itemized our estimation of
20 what additional costs it would take to move to the
21 Hanford, Idaho and Savannah River site.

22 A similar assessment of costs for relocation
23 to sites within the TVA Valley appear in Table 3 in
24 Appendix G, Page 28.

25 JUDGE MILLER: I think we were talking about

5-10 1 the DOE sites, though, weren't we, these three in your
2 testimony?

3 THE WITNESS: Okay.

4 JUDGE MILLER: Now, those cost factors there
5 related to, and it may well show here, what year? Are
6 they sub-cost factors? Are they historic factors? What
7 are they?

8 THE WITNESS: It is basically -- This Table 8
9 was based on the decision to relocate to a different site
10 on October of this year.

11 The table was calculated the beginning part of
12 this year. The assumption at that time was made that a
13 decision, if it was made, would be made in October of '82.

14 We have calculated, using the Clinch River
15 cost as a base, what additional costs to the project it
16 would cost them to construct and operate the plant at
17 these three other sites.

18 JUDGE MILLER: So first of all, then, it's
19 1982 dollars.

20 THE WITNESS: No, sir.

21 JUDGE MILLER: All right, then, how do we need
22 corrections?

23 THE WITNESS: The numbers in this table are
24 year of expenditure dollars.

25 JUDGE MILLER: Well, are they significantly

5-11
1 different or did you extrapolate into the future those
2 things that would occur in the future in order to take into
3 account the present value of future money?

4 THE WITNESS: We did not do a present value
5 calculation. I believe the Staff --

6 JUDGE MILLER: This is put largely, then, in
7 1982 dollars, I guess, aren't they?

8 THE WITNESS: They are year of expenditure
9 dollars. That is to say if -- the over-all cost estimate
10 of 3.2, or whatever the correct number is, is year of
11 expenditure dollars.

12 That's the number that Congress is going to
13 have to authorize. We have similarly constructed this
14 table in that context.

15 That is to say, the first term here is
16 escalation. If we are going to spend some of this money,
17 say, 43 months later than we had anticipated, there is
18 built in here an 8 percent escalation rate on that number.

19 JUDGE MILLER: Okay. What does "escalation"
20 mean in that table?

21 THE WITNESS: Escalation is computed based on
22 the amount of money that the project still would have to
23 spend after October of 1982, and the fact if we had to
24 relocate, spend that out over a 43-month longer period.

25 JUDGE MILLER: You are using the 43-month

5-12 1 delay case.

2 What about inflation factors and the cost or
3 price of money in any given year? I'm not trying to get
4 into the details of it, but were those or were those not
5 built into the first line, which is called "Escalation,"
6 which I guess you mean incremental costs in millions of
7 dollars, and you are saying it is \$601 million more.

8 THE WITNESS: Yes. That is based on an eight
9 percent escalation rate.

10 JUDGE MILLER: Per year?

11 THE WITNESS: Per year.

12 JUDGE MILLER: Then you did figure it in?

13 THE WITNESS: Yes.

14 JUDGE MILLER: All right. "Staff," "Stretch-
15 Out," "Equivalent," and so forth.

16 What about the -- Increased costs would
17 mean over and above existing expenditures, I assume, or
18 the value of them; is that right?

19 THE WITNESS: Yes. For instance --

20 JUDGE MILLER: So you are taking, then, the
21 sunk cost theory on Clinch River. You've got sunk costs
22 now?

23 THE WITNESS: Yes, sir.

24 JUDGE MILLER: Okay, so you took those
25 concepts into consideration and you've gone through -- I'm

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1 not going to go into details of it, but you wound up
2 saying it would cost 1588 --

3 THE WITNESS: Million.

4 JUDGE MILLER: -- million dollars additional --

5 THE WITNESS: That would be --

6 JUDGE MILLER: -- in the case of Hanford.

7 THE WITNESS: That would be on top of the
8 present cost estimate of the \$3.2 billion, yes.

9 JUDGE MILLER: These are incremental costs.

10 THE WITNESS: Yes.

11 JUDGE MILLER: Additional.

12 THE WITNESS: Above what the present estimated
13 project cost is, yes, sir.

14 JUDGE MILLER: Okay. Do you have anything
15 else which this term "lesser cost" means as one of the
16 three outweighing factors on Page F-33?

17 THE WITNESS: This is the reference to the
18 cost.

19 JUDGE MILLER: That's it, okay.

20 Now, you've got the second point there,
21 "greater benefits."

22 Tell me what that means and what your back-up
23 material is. I won't ask you to go into detail, but I
24 want to be able to locate it.

25 THE WITNESS: Okay. We examined the LMFBR

-14
1 program objectives to see if any of those would be site-
2 related.

3 Our conclusion, and it's presented in
4 Appendix E of the Environmental Report, essentially said
5 in looking at the program objectives, there would be only
6 two of those objectives which would be site-related.

7 As an example of one that would be not,
8 maintainability, which is a program objective, is not
9 going to be site-related.

10 The two that we viewed as site-related were,
11 first of all, the DOE timing objective, which is
12 construction and operation of the LMFBR demonstration
13 plant as soon as possible.

14 The second was the construction, the design,
15 construction and operation of the LMFBR demonstration
16 plant with extensive utility involvement.

17 JUDGE MILLER: That's the next one, I think.
18 "Enhanced effectiveness of the demonstration in the
19 utility environment," I think, is the third point, so
20 don't mix them up.

21 "Greater benefits," I want to be sure I've
22 covered. I thought you said there were two of them. You
23 have told me one.

24 THE WITNESS: Well, the two that I'm referring
25 to is the timing and the utility and the cost are the

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1 three that we specifically took a look at.

2 JUDGE MILLER: All right. Then the timing
3 is really the only benefit of the "greater benefits" that
4 you deem to be significant, really, in this context?

5 THE WITNESS: Yes.

6 JUDGE MILLER: So we are going into the third
7 now in the manner in which I broke them out.

8 THE WITNESS: Yes, sir.

9 JUDGE MILLER: And the third one, then, is
10 "the enhanced effectiveness of the demonstration of the
11 fast metal breeder reactor..." and so forth, "...in
12 the utility environment for the Clinch River site.

13 Now, tell me a little bit about that.

14 THE WITNESS: Okay. There's a more precise
15 definition of that objective in the Final Supplement to
16 the LMFBR program.

17 They are also listed in Appendix E.

18 Basically, what that means is the design,
19 construction and operation of the demonstration plant,
20 really, with extensive utility involvement in that
21 process, and also with a utility operating that facility
22 as an integral part of their system.

23 The best example is the arrangements that the
24 projects presently have with TVA and Commonwealth Edison
25 where TVA and Commonwealth Edison personnel, in conjunction

-16
1 with DOE people, staff the Clinch River Project Office;
2 and wherein the arrangement is for TVA to operate the
3 plant as an integral part of its system.

4 JUDGE MILLER: As a corollary to that, do
5 you regard the TVA operation over all as being typical of
6 a utility operation?

7 You see, you are getting certain results.
8 Informational needs were taken as given in a utility
9 environment, and I'm inquiring now whether the TVA is
10 typical for all purposes.

11 Undoubtedly, it is for some, because it
12 generates electricity by means of various forms of power
13 and the like.

14 THE WITNESS: Yeah, I would characterize TVA
15 as a typical utility. It has extensive experience in
16 nuclear and would be typical of a --

17 JUDGE MILLER: You mentioned Commonwealth --
18 no. What was --

19 THE WITNESS: Commonwealth Edison and TVA are
20 the --

21 JUDGE MILLER: Yes, Commonwealth Edison,
22 Illinois?

23 THE WITNESS: Yes, out of Chicago.

24 JUDGE MILLER: Okay. What was to be the role
25 of Commonwealth Edison in regards to the informational

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needs and objectives pertaining to the demonstration of
the fast breeder in a utility environment?

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WITNESS KRIPPS: Commonwealth Edison is and has been providing, since early in '72, staff people which compose again -- I'm not sure what the exact number --

JUDGE MILLER: What kinds of staff?

WITNESS KRIPPS: Professional engineering people.

JUDGE MILLER: Engineering.

WITNESS KRIPPS: Management people.

JUDGE MILLER: Management too?

How did management get into this?

WITNESS KRIPPS: Well, you get --

Okay. Management consists of professional people that do some managing at the project office but we also get support from technical people and management people from the home office, up in Chicago, also.

JUDGE MILLER: They're pretty busy up there with quality assurance and things like that, I think, in Illinois and other places.

Is that being brought to bear, also, in your future consideration? I know you haven't spoken on that.

WITNESS KRIPPS: Commonwealth Edison does not have any designated role in operation of the plant. That's solely going to be TVA.

JUDGE MILLER: Okay.

WITNESS KRIPPS: TVA has --

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1 JUDGE MILLER: I see. I was wondering if --
2 I think that's enough now.

3 I have taken into those matters so I would
4 understand them.

5 I'm going to declare a recess, which gives
6 everybody a chance to regroup, and Judge Linenberger will
7 have a question or two and then we'll get out of your
8 hair,

9 JUDGE LINENBERGER: Well, sticking with, for
10 just a minute more, with the line of inquiries or
11 discussion you were having with the Chairman; on Page 10
12 of your testimony, you use the term "institutional
13 factors". Fourth line from the top.

14 Now, in the context of the categorization
15 of benefits that you were just discussing with the Chairman,
16 where does this "institutional factors" consideration fit?

17 WITNESS KRIPPS: I consider the institutional
18 factors, and that's the terminology from the proposed rule,
19 to be the LMFER program objectives, which, in this
20 particular case, differentiated between sites and the
21 timing objective and the extensive utility involvement.

22 That is what I consider "institutional
23 factors".

24 JUDGE LINENBERGER: All right.

25 Thank you very much.

1 JUDGE MILLER: All right.

2 Ten minutes, please.

3 (Short recess.)

4 JUDGE MILLER: Are you ready, Mr. Tousley?

5 You may proceed.

6 BY MR. TOUSLEY:

7 Q Just to clarify, the three factors that you
8 just discussed at some length with the Board, at the
9 bottom of Page F-33, that is, lesser costs, greater
10 benefits and enhanced effectiveness of the demonstration.

11 Those were not considered in your conclusion
12 on Page 15 of your testimony, that the DOE sites were not
13 environmentally preferable to the Clinch River site; is
14 that correct?

15 A That is correct.

16 When I referred to the judgment on
17 environmental preferability, I am referring to a judgment
18 based on environmental factors.

19 And the project has also thrown in
20 meteorology as one of those environmental factors.

21 When I reached a conclusion in terms of
22 "substantially better" or "obviously superior", and I
23 equate the two terms, "obviously superior" and
24 "substantially better", when that judgment is made, I am
25 including not only environmental engineering and other

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1 siting factors, but also economics and LMFBR program
2 objectives.

3 Q Fine. I just wanted it understood, then,
4 that you are not considering those in the conclusion about
5 environmental preferability.

6 A No, sir.

7 Q Okay.

8 JUDGE MILLER: And in the use of the terms,
9 would you consider that "substantially superior", would
10 be equated with anything?

11 I've cloned it.

12 WITNESS KRIPPS: I guess that could be another
13 way of saying the same thing.

14 JUDGE MILLER: But essentially, as you
15 construe the terms, it's about the same thing?

16 WITNESS KRIPPS: Yes.

17 "Substantially better" originated out of
18 the Commission's order and I have --

19 JUDGE MILLER: In this case?

20 WITNESS KRIPPS: Yes.

21 -- and the "obviously superior" comes out of
22 the proposed rule and, again, insofar as I am concerned,
23 they are the same. The same judgment is involved in both
24 of them.

25 JUDGE MILLER: That also came out of some

1 Commission and Appeal Board rulings on lightwater reactors,
2 Seabrook and others, preceding the proposed rule, too.
3 The "obviously superior" test.

4 Okay. Go ahead.

5 BY MR. TOUSLEY:

6 Q Okay.

7 Since you have not identified other
8 environmental factors which are preferable at the DOE
9 sites, compared to the Clinch River sites, your conclusion
10 that the DOE sites are not environmentally preferable
11 is based solely on the fact that you considered the
12 factor of 50 or 25 reduction in risk as non-significant;
13 is that correct?

14 MR. EDGAR: You are referring to risk
15 reduction?

16 MR. TOUSLEY: The radiological risk -- the
17 combined consideration of population and meteorology.

18 JUDGE MILLER: Is that the components of
19 probability plus consequences?

20 MR. TOUSLEY: No. This is consequences.

21 JUDGE MILLER: Consequences only. Okay.
22 Not probability.

23 MR. TOUSLEY: Correct.

24 JUDGE MILLER: Enhanced risk, as the term is
25 used our proceedings?

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MR. TOUSLEY: Yes.

It has been pointed out to me that the language on Page F-33, that we've been discussing, in terms of the factors of 50, says:

" -- that the consequences enhance the risks associated with design basis accidents at CRBRP are less than those associated with natural background radiation, although the analysis showed that the more favorable dispersion characteristics and population distribution reduced these consequences by a factor of 50."

JUDGE MILLER: Those risks, insofar as probability is concerned, I think that could be viewed against the design basis accidents.

MR. EDGAR: Yes.

And there's another sentence --

JUDGE MILLER: Which is the other side of that coin on this.

MR. EDGAR: There's another sentence that wasn't quoted here that is really important to complete the Chairman's point here.

That's the last sentence in the paragraph:

6-7 1

2 "For additional information on
3 this analysis and the discussion
4 on how the requirements in design
5 features of CRBR will insure that
6 the risks associated with
7 accidents are -- "

8 and so on and so forth.

9 So that the thought is complete, I only ask
10 for clarification because I think that these concepts can
11 get overlapped.

12 JUDGE MILLER: Yes. We want to be sure we are
13 being as precise as we can with some concepts that are
14 not always --

15 Okay. You may proceed.

16 BY MR. TOUSLEY:

17 Q I don't believe I got an answer to my question.

18 JUDGE MILLER: Do you recall the question?

19 If not, we better have it --

20 WITNESS KRIPPS: I recall the answer I was
21 going to give.

22 JUDGE MILLER: Ask the question again. Probably
23 it's the same, but we'll make sure.

24 BY MR. TOUSLEY:

25 Q Is your conclusion that the three DOE sites
 are not environmentally preferable based solely on the

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1 fact that you considered the factor of 50 difference in
2 the consequences that you discuss on Page F-33, to be
3 insignificant?

4 JUDGE MILLER: Not quite the same question;
5 is it?

6 WITNESS KRIPPS: That's a long question.

7 The answer is yes and the real answer is, it
8 appears in response to Question -- in Answer No. 12 in my
9 testimony and that's really your best source to tell you
10 what my assessment was and it essentially says, that, yes,
11 we have found that the three DOE sites and some of the
12 alternative TVA sites, do have more favorable X/Q in
13 population around it.

14 We know, however, that this would result -- and
15 the consequences of those two factors, the importance of
16 those two factors in doing an environmental assessment, is
17 the fact that they would result in lower off-site doses
18 associated with releases of radioactive material.

19 However, and I'm reading now from my testimony
20 on Page 14. It says:

21 "The reduction in calculated doses
22 at these alternative sites,
23 however, does not represent a
24 significant difference in terms
25 of expected environmental impact."

6-9

1 It then references the testimony which the
2 Applicants has presented on site suitability source term
3 for Contentions 1, 2 and 3 back in August. In terms of
4 site suitability source terms, it says:

5 "This testimony ---"
6 referring back to the Applicants testimony in August --

7 " -- also showed that CRBRP can be
8 designed so that greater accident
9 consequences are highly unlikely."

10 It goes on then to reference the Applicants' testimony on
11 health effects, which was heard here this week, in which
12 I --

13 Q. Excuse me.

14 I'm not sure all of this is necessary.

15 I think you answered the question.

16 JUDGE MILLER: Well, he answered it in two
17 levels. He said yes, but the yes includes components
18 they took into consideration.

19 Now, if you want to stop him from giving his
20 complete answers as he sees it --

21 MR. TOUS : Well, --

22 JUDGE MILLER: You will bear the consequences.
23 Let's put it that way. Because he's giving you that which
24 he says is not a simple yes or no. He's willing to give
25 you his yes but, as he pointed out, your question was

6-10

1 somewhat long and involved and, as I noted, there were
2 some slight nuances in there that hadn't been in
3 precedingly and, therefore, to have a fair, full answer,
4 you can either cut him off, if you wish, -- I'm sure it
5 will come out in redirect -- or you can let him finish.

6 BY MR. TOUSLEY:

7 Q Well, let me ask this.

8 Do you -- the reason that you considered these
9 differences to be insignificant because the risks, as
10 you calculate them, are very low? Is that correct?

11 Is that the gist of what you were just
12 explaining?

13 A I would not use the term "risk". I have used
14 the words that they result in insignificant differences
15 in terms of expected environmental impact.

16 I did not use the word "risk" here, in the
17 testimony.

18 Q But you were discussing in this instance the
19 radiological impact of accidents; is that correct?

20 A Yes.

21 Q Is the basis for your judgment, the fact that
22 the Clinch River site meets the requirements or allegedly
23 meets the requirements of 10 CFR Part 100 and Part 50?

24 A That is a part of that basis, yes, sir.

25 Q Would you say that --

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A. Let me clarify.

When you say 10 CFR Part 50, I assume you are referring to Appendix I, in terms of normal releases?

Q. Would you say that among sites which satisfy the criteria of those portions of the NRC regulations, among all sites which satisfy those regulations, would any of them be preferable to others, on the basis of radiological risk from accidents?

In routine releases.

A. I really haven't made that determination. The proposition that two sites both meet the regulations, in terms of the site suitability source term for 10 CFR 100 and the normal releases in terms of 10 CFR 50, Appendix I, states that they both would be suitable sites in terms of radiological consequences, I would hesitate to give a blank answer to the question, either yes or no.

Q. All right.

/

1 BY MR. TOUSLEY:

2 Q Okay. Let me make it a little more concrete
3 for you.

4 If there were two sites which both satisfied
5 these NRC requirements, but the radiological risks differed
6 by a factor of 500, would that difference be significant
7 in your opinion?

8 A I don't really know. I have not made that
9 kind of judgment.

10 Q You can't give your judgment now as to whether
11 that would be significant?

12 A I do not know.

13 Q Can you tell me what you would need to know
14 or do in order to be able to answer that question? What
15 is the reason for your inability to answer?

16 MR. EDGAR: Objection. Asked and answered.

17 JUDGE MILLER: Sustained.

18 MR. TOUSLEY: I believe he only said he didn't
19 know the answer, not why.

20 MR. EDGAR: Well, it's your job to ask
21 questions.

22 JUDGE MILLER: He doesn't have to explain why
23 he doesn't know, which could be any of a hundred different
24 reasons, I suppose, all the way from stupidity on one
25 score and insufficient data on the other, and anything

1 in between.

2 But it's a waste of time -- Also, it's
3 not really very material.

4 You may probably, by framing the appropriate
5 question -- you can probably determine that which you
6 apparently want to find out.

7 But you are the interrogator.

8 BY MR. TOUSLEY:

9 Q If one site met the requirements of 10 CFR
10 Part 100 and Part 50 of Appendix I marginally, and another
11 site were 500 times better in terms of radiological risk,
12 would you say that the latter site would be environmentally
13 preferable, in terms of radiological risk to the former?

14 A I could draw no conclusion based on your
15 question.

16 Q I'd like to ask you to turn to Page G-28 of
17 the Environmental Report. This is Table 3. It gives the
18 cost impact of relocating CRBRP to an alternative TVA
19 site.

20 In this table, for certain of the factors --
21 well, to begin with, I assume that the alternative TVA
22 sites that are included here are the four that were formally
23 considered in the alternative siting analysis; that is,
24 Hartsville, Phipps Bend, Murphy Hill and Yellow Creek;
25 is that correct?

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1 A They are included only in the context that
2 the intent of this table was to encompass the range of
3 additional costs, were the plant to be relocated to
4 another site within the Tennessee Valley power service
5 area.

6 Q And were you not considering those four sites?

7 A We did not consider those four sites
8 specifically. As is indicated in the introduction to this
9 table, at the conclusion of the first part of the two-
10 part sequential test, which NRC asked us to look at this
11 in terms of, we determined that none of the ten alter-
12 native candidate TVA sites were found to be environmentally
13 preferable.

14 At that point, in accordance with the proposed
15 rule, we would not have had to go to the second part of
16 the test.

17 However, NRC specifically asked for additional
18 information. Hence, we did go and take a look at the
19 second part of the test, which involved the economic,
20 institutional and technological factors.

21 When we got to the costs, in trying to deter-
22 mine what the incremental increase in costs would be to
23 another TVA alternative site, based on our conclusions in
24 Part I, we didn't know which one to pick.

25 We chose that it was prudent then to take a

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1 look at a range of values for those parameters in this
2 table, which we felt might vary between sites within the
3 Valley and try to conservatively estimate what that
4 additional cost would be.

5 Conservative in this term means I tried to
6 minimize the cost. Obviously, the lower cost is the
7 conservative direction here.

8 And so in terms of we had tried to encompass
9 any site within the TVA Valley, we have indirectly included
10 those for sites which you indicate, because they are
11 in the Valley.

12 Q So the specific numbers that you list here in
13 these ranges -- for instance, on Line 3 -- "\$7 to 36
14 million -- Line 6, 0 to \$137 million are not associated
15 with particular sites?

16 A That is correct. It is intended to encompass
17 the incremental costs from, hopefully, any site within
18 the Valley.

19 Q Well, I'm interested in how you derived the
20 bounds of those ranges.

21 A Let me give you an example --

22 Q -- and the costs that would be incurred,
23 without considering the particular sites.

24 A Okay. Let me explain to you the basis of
25 the range there for Item 3 which you have indicated,

1 equipment procurement.

2 If you go to the next page, G-29, on Item 3
3 where we have explained what that line item means, it
4 says that "Those costs include costs for continued stor-
5 age, crating and reloading and transportation of al-
6 ready delivered components and differences in transporta-
7 tion costs for all components not yet delivered."

8 The range of values between 7 and 36 basically
9 reflect that most of the sites which one would select in
10 the TVA service area would have barge unloading facilities
11 available to them for the very large components, parti-
12 cularly the reactor pressure vessel.

13 There are some sites, however, which would not
14 have this barge transportation means available to them.
15 A specific instance would be Phipps Bend.

16 But, in addition to Phipps Bend, there are
17 other sites which also would not have barge unloading
18 facilities available to them.

19 The 36 -- the higher bound is basically a
20 reflection of a site which would not have barge unloading
21 facilities available to them, and would require very
22 expensive overland transportation of those very heavy
23 components, and hence, the higher range, and, hence, the
24 7 to 36 is meant to encompass that -- the whole range of
25 sites.

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1 Some sites might be seven. But if you picked
2 one site, it might be 36, depending on the particular
3 site.

4 JUDGE HAND: Perhaps if I could break in.
5 If you have to build something to replace a barge un-
6 loading site, if you were to abandon Clinch River, you
7 wouldn't have to build a barge unloading site; and there
8 would be some savings in cost -- I don't know what the
9 barge unloading site costs you -- but does that mean that --

10 THE WITNESS: Okay --

11 JUDGE HAND: -- would that be as much as \$7
12 million?

13 THE WITNESS: I'm sorry. You misunderstood.
14 When I say "not a barge" -- I'm talking about
15 located on a river, which is not navigable by barges.

16 JUDGE HAND: I understood that.

17 THE WITNESS: And hence I could not get a
18 barge close to that facility. And, hence, I would have to
19 transport it over site -- overland.

20 JUDGE HAND: But in terms of changed costs,
21 if, in fact -- I assume that these are all additional
22 costs.

23 THE WITNESS: Yes, sir.

24 JUDGE HAND: These are added to your base
25 dollars?

THE WITNESS: Yes, sir.

JUDGE HAND: And in that is the cost of building a barge unloading facility at the Clinch River site.

THE WITNESS: Yes, sir.

JUDGE HAND: How much is that going to cost?

THE WITNESS: I do not know the precise number.

JUDGE HAND: Might it be as much as \$7 million?

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1 THE WITNESS: No, sir.

2 JUDGE HAND: But that was not taken into
3 account when you did those calculations?

4 THE WITNESS: That was specifically not taken
5 into account. I would have to say that we did not --
6 No, excuse me.

7 The barge unloading facility for Clinch
8 River has not been constructed. Hence, that's a cost
9 which the project has not yet expended on Clinch River.

10 If I was to move to a new site, I would still
11 have that money, and I would not have spent it. That's
12 not an additional cost.

13 MR. TOUSLEY: Are you -- I don't want to
14 interrupt.

15 JUDGE HAND: All right.

16 BY MR. TOUSLEY:

17 Q A couple of these alternative TVA sites are
18 sites of now-cancelled nuclear projects. Might they
19 already have barge-unloading facilities which would,
20 in fact, result in a saving compared to Clinch River
21 which does not?

22 I'm speaking of Hartsville and Yellow Creek.

23 A. Yes.

24 Q. Is that reflected here?

25 A. No.

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1 Q With respect to other parameters in this list,
2 are the savings which would be incurred at those sites
3 where there have been other nuclear projects cancelled,
4 reflected in this table; for example, site work?

5 A We have not specifically looked at cost
6 savings that may or may not be involved in moving to a
7 site which may have already had some preparation done on
8 it.

9 We have not looked at the cost savings or
10 the additional cost. And they are not -- Those are not --
11 Since we have not looked at them, they're not reflected
12 in this table.

13 Q What is the meaning of Line 9, "Site-Work
14 Package"?

15 A Site-work package is in specific reference
16 to a package of work which the project office has
17 defined. It basically entails road and railroad con-
18 struction, and also takes a look at -- and basically it's
19 an engineering design type of -- If I know what my
20 plant layout is going to be and what my final elevation
21 for my plant buildings are going to be, and I know what
22 the topography is, there is an engineering effort that
23 has to involve in -- I'm going to cut this hill down here
24 and move it over here, and I'm going to get everything --
25 I'm going to end up doing all my cutting and filling.

1 It's an engineering effort that involves
2 defining what cutting and filling operations have to be
3 done in order to construct the plant.

4 Q And since there have been nuclear projects
5 under construction at Hartsville and Yellow Creek, might
6 that work not already be done at those sites?

7 A No, sir, not for Clinch River.

8 Q In terms of -- you mentioned railroads, roads,
9 transportation facilities, that sort of thing.

10 A I cannot make a judgment on whether or not
11 things that may or may not have been done would be
12 compatible to location of an LMFBR plant. They may or
13 may not.

14 Q But it is possible that those already installed
15 facilities could be adaptable or usable, as is, to some
16 extent?

17 A We have done a little bit of a look at
18 that. Our judgment reached was although one might be
19 able to find some incremental cost savings, that when
20 judged against the additional cost which it would take to
21 relocate there, that it would not be -- it would really
22 not change the ultimate judgment that it would be
23 substantially more expensive to move to that site.

24 Q Is that reflected in this table?

25 A The table does not reflect that. It's

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1 reflected in the statement that I just made.

2 Q I believe in a discussion with Chairman Miller
3 earlier about the similar chart that you have in Appendix
4 F for the DOE sites, you stated that inflation was in-
5 cluded; is that also correct of this chart for the TVA
6 sites?

7 A Yes, sir. This Table 3 is based on yearly
8 expenditure dollars, which have assumed an eight percent
9 escalation rate.

10 Q Are these figures discounted to reflect the
11 present value of the money spent?

12 A That's what I meant when I said the last
13 answer. No, sir, we have not converted to present value
14 dollars.

15 MR. TOUSLEY: If I may have just a minute,
16 Mr. Chairman.

17 (Pause.)

18 BY MR. TOUSLEY:

19 Q In Appendix G, in discussing both the impacts
20 of the Clinch River Breeder Reactor on endangered mussels
21 in the Clinch River and on the striped bass in the Clinch
22 River, you state that these should not be factors in the
23 alternative siting analysis?

24 MR. EDGAR: Where are they? Where is the
25 reference?

7-12

1 MR. TOUSLEY: Page G-17. It's the reference
2 to the mussels, the very last sentence. And Page G-24,
3 referring to the striped bass.

4 BY MR. TOUSLEY:

5 Q When you say that these concerns should not
6 be a factor in the alternative siting analysis, what do
7 you mean?

8 A They were obviously considered; that is to
9 say, they were a factor in the analysis because they were
10 considered.

11 What is implied here is that they should not
12 be looked at as a factor which differentiates the
13 sites.

14 That is to say, for these two factors, we have
15 found that the environmental impact from construction and
16 operation of the LMFBR demonstration plant at Clinch
17 River would not lead to any adverse environmental im-
18 pacts.

19 And, hence, on a rating scale with any other
20 site, the most another site would be, in comparison with
21 Clinch River, would be equivalent in terms of these
22 parameters.

23 I guess what I'm saying: It should not be
24 a factor in the final weighing of differences -- in the
25 final qualitative weighing of differences between sites.

7-13

1 Q Is it correct that there are still studies
2 ongoing by the Applicants on both of these issues --
3 the effects on the mussels and on the striped bass?

4 A No.

5 Q Doesn't the Environmental Report describe
6 further studies on populations of mussels in the Clinch
7 River that are being conducted; or have those been com-
8 pleted?

9 A They have been completed.

10 JUDGE MILLER: Was that that pink pearly
11 something or other?

12 THE WITNESS: Yes.

13 MR. TOUSLEY: What was that?

14 JUDGE MILLER: "Pearly" something or other.

15 MR. MIZUNO: Pink mucket pearly mussel, I
16 believe.

17 JUDGE MILLER: Yes, that's it.

18 BY MR. TOUSLEY:

19 Q I believe at one point at the beginning of
20 this Appendix G -- mentioned the possible presence of
21 11 species of endangered mussels, and later we only hear
22 about one, which has been found. What about the other
23 ten?

24 MR. EDGAR: Do you have a reference -- a
25 point --

1 MR. TOUSLEY: Page G-17.

2 JUDGE MILLER: Page 16 also.

3 MR. TOUSLEY: Yes.

4 JUDGE MILLER: "Eleven species of endangered
5 freshwater mussels may be present in the vicinity of
6 Clinch River," etc.

7 THE WITNESS: Let me give you some chronology.
8 When the Staff --

9 JUDGE MILLER: You asked for mussels. Now
10 you're going to get a chronology. Do you want chronology?

11 MR. TOUSLEY: No.

12 BY MR. TOUSLEY:

13 Q Just tell me what happened to the other ten
14 mussels. Someone has apparently identified the possible
15 presence of 11. I believe the studies only referred to
16 one species.

17 A At the request of NRC, the U. S. Fish and
18 Wildlife Service provides a service whereby they identified,
19 based on past records, threatened and endangered species
20 that are identified on the federal list which may occur
21 in a vicinity.

22 This was the basis for the original list of
23 11. We -- The Project did a literature survey. It
24 provides responses to NRC questions, and in addition,
25 did an extensive on-site program to search for these

1 mussels.

2 The actual search program for the mussels did
3 not find any of these 11. However, in a different TVA
4 study that was going on for sauger eggs, there was
5 collected above the Clinch River site one species of --
6 what --

7 JUDGE MILLER: Pink mucket pearly mussel.

8 THE WITNESS: Okay.

9 BY MR. TOUSLEY:

10 Q So the answer is that there have simply been
11 no examples of the other ten found?

12 A The conclusion that the Project reached was
13 that these other ten were not present in the vicinity of
14 the Clinch River site.

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1 Q With respect to the striped bass, were there
2 not TVA studies of the thermal effects on the striped bass
3 being conducted, or planned to be?

4 A I'm referencing Page G-22 at the bottom,
5 which indicates that "Currently TVA has studies under way
6 at its Biothermal Research Station, located at the
7 Browns Ferry Nuclear Plant, to determine lethal
8 temperatures for adult and juvenile striped bass under
9 controlled fuel conditions in the experimental outdoor
10 channels at this facility."

11 So yes, there are ongoing studies.

12 Q They are currently doing studies to determine
13 the lethal temperature?

14 A I wouldn't swear that today -- I don't know
15 whether they have been done, completed or ongoing. The
16 only evidence -- They may have been completed and they
17 are in the process of putting the data together.

18 As it says in the next sentence, "The
19 preliminary results for this study will be available in
20 late '82."

21 That's the latest information that I have.

22 Q Okay. I would like to direct your attention
23 to Page G-21, the last sentence, which says, "Maximum
24 surface temperature in the plume near the discharge under
25 worst-case hypothetical conditions would be less than

1 80 degrees Fahrenheit. This is several degrees below the
2 estimated lethal temperature for striped bass."

3 What is the source of this "estimated lethal
4 temperature" that is referenced here?

5 A. References 10, 11, 12 and 13 that appear at
6 the bottom of that page.

7 Q. Are those specific to the Clinch River?

8 A. I do not know.

9 JUDGE MILLER: Well, would it matter on
10 temperatures which are lethal to striped bass? Would it
11 matter which body of water you had the lethal temperature?
12 BY MR. TOUSLEY:

13 Q. Do you know what the lethal temperature for
14 striped bass is?

15 A. Several degrees below 80 degrees Fahrenheit.

16 JUDGE HAND: Estimated.

17 THE WITNESS: Estimated.

18 JUDGE HAND: Mr. Kripps, is the striped
19 bass native in the Clinch River?

20 THE WITNESS: No, sir.

21 JUDGE HAND: Where does the concern for the
22 striped bass come from when you are dealing with an
23 introduced species?

24 THE WITNESS: I believe that there was a
25 concern raised, principally because the State of Tennessee

1 has a stocking program of striped bass in the reservoir,
2 and they apparently are a sport fish.

3 The concern, as is documented -- I guess it's
4 described here, is basically during late summer when
5 the temperature of the water starts getting fairly high
6 in Watts Bar, the striped bass are basically a cool
7 water fish, and hence, they seek cooler reservoirs.

8 The arm of the Clinch River between Watts
9 Bar and Melton Hill Dam is a cooler reach of the river,
10 which the striped bass go to when it gets hot out in
11 the reservoir.

12 The concern was whether or not the thermal
13 discharges from Clinch River's operation would have a
14 significant impact on these striped bass as they may
15 collect there, particularly when there may be no flow
16 from Melton Hill Dam, under which conditions the thermal
17 plume from the Clinch River site may get a little more
18 extensive.

19 JUDGE HAND: Thank you.

20 JUDGE MILLER: Don't striped bass return to
21 the brackish waters of their origins in order to
22 propagate each year?

23 THE WITNESS: I don't know.

24 JUDGE HAND: Do striped bass propagate
25 naturally in the Clinch River?

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1 THE WITNESS: My understanding is that
2 because they are basically a cool water fish, that they
3 are not reproducing very well, and that basically, their
4 continuance in this body of water is really only due to
5 the fact that the state is continually stocking them.

6 MR. EDGAR: Mr. Chairman, if you won't cross-
7 examine me, I'll mention one fact.

8 JUDGE MILLER: I promise.

9 MR. EDGAR: As a fisherman, Cooper Santee Lake
10 in South Carolina, when you drive down the highway, they've
11 got big advertisements for land-locked striped bass.

12 They were introduced in there years ago.

13 JUDGE MILLER: Yes, I recall that.

14 I was thinking of Chesapeake Bay.

15 MR. EDGAR: Understood. That's the classical
16 anadromous pattern.

17 JUDGE MILLER: We mutually agree and have to
18 test each other's knowledge.

19 (Laughter.)

20 JUDGE MILLER: The life and loves of striped
21 bass, also known as rockfish.

22 MR. EDGAR: We could tell fish stories, too.

23 (Laughter.)

24 JUDGE MILLER: Okay, you may proceed.
25 /

8-5
1 BY MR. TOUSLEY:

2 Q Mr. Kripps, do you happen to know if striped
3 bass tend to favor surface waters or bottom of rivers, or
4 if there's any preference at all?

5 A I recall from a document that I read that
6 based on some studies that Dr. Koutant did, I think there
7 was a reference that they favor the shallows at the edge
8 of the shores where you might be shaded by branches and
9 bushes and stuff.

10 That's the only reference I can recall on
11 that subject.

12 Q If that were the case, that they favored the
13 shallows near the edge of the shores, wouldn't that
14 maximize the effect of the thermal plume on their passage
15 through the river, since the thermal effects are limited
16 to the upper portion of the river column?

17 A The studies that we have done have basically
18 shown that -- even though we are having additional studies
19 ongoing to verify this -- is that because the cool
20 thermal refuge in the Clinch River arm here really
21 extends all the way from down at Kingston all the way up
22 to the Melton Hill Dam, and because the plume, as you
23 indicated, has a tendency to stay at the top, really the
24 top third of the water is what our studies have shown,
25 is that our thermal plume will not in any way -- or should

1 not prohibit the fish from swimming under the plume
2 getting somewhere upstream or downstream.

3 Q Going back to the mussels for a minute, on
4 Page G-17, you state, "There's no reason to believe that
5 there's a significant population of any endangered mussels
6 in the river near the site."

7 What would a "significant population" be, in
8 your view?

9 A I guess I don't have a view on that.

10 Q Isn't it correct that if there were likely to
11 be any further endangerment caused by the plant at the
12 site, the site would not even qualify as a candidate site
13 under one of the criteria in the proposed rule on
14 alternative sites?

15 I'm referring to the Criterion 2 of Part 6(b).

16 MR. EDGAR: Could we hand the witness the
17 criterion?

18 THE WITNESS: The answer is if at the Clinch
19 River site there was a determination under the auspices of
20 the Endangered and Threatened Species Act that there would
21 be an adverse impact or a further threatening of a
22 threatened or endangered species on that federal list,
23 then the Clinch River site would not qualify -- or any
24 other site that would found to violate the Endangered
25 Species Act could not be considered to be a candidate

1 site, yes.

2 BY MR. TOUSLEY:

3 Q Would you read this Criterion No. 2 into the
4 record for us, please, just so that --

5 MR. EDGAR: It's already in the record.

6 JUDGE MILLER: If it's already in, it would
7 be redundant.

8 MR. TOUSLEY: Okay, fine.

9 I have no further questions of this witness.

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1 JUDGE MILLER: Thank you.

2 Staff?

3 MR. MIZUNO: Yes, the Staff has a few questions.

4 JUDGE MILLER: Go ahead.

5 CROSS-EXAMINATION

6 BY MR. MIZUNO:

7 Q Mr. Kripps, turn to Page 6 of your testimony.

8 A Okay.

9 Q Is it true that the Applicants rejected the
10 hook-on option in the 1982 updating of the original
11 environmental alternative site analysis?

12 A Yes.

13 Q And where is that discussion contained within
14 the Environmental Report?

15 A I believe there's a small discussion in
16 Appendix G. The basic response -- the basic addressing of
17 that issue was in response to an NRC question.

18 I believe the appropriate reference is
19 one of the amendments, 320.1, I think, but I'm not quite
20 sure.

21 It was in response to an NRC question, which
22 can be found in the Environmental Report.

23 Q Thank you.

24 Now, turning to Page 10 of your testimony,
25 this is in your Answer 7. You state that two potential

1 sites were identified.

2 A. Yes, sir.

3 Q. Yes. Are those sites the Peach and Artemis
4 sites in Kentucky?

5 A. Yes.

6 Q. On Page 12 of your testimony, in your answer
7 to Question 10, the last sentence in second-to-the-last
8 line from the bottom of the answer, you state that, "The
9 comparison of alternative DOE sites...was quantitative
10 using conservative and annual average."

11 Do you mean "conservative annual average"?

12 A. No. Table 1 in Appendix F includes both
13 conservative -- when I say "conservative" here, I'm
14 referring to 5 percentile X/Q's, and annual average is
15 a different number. It's an annual average.

16 Q. Okay. Do you recall the discussion where you
17 were referring to Table 1 of Appendix F, talking about
18 the X/Q values given in that table?

19 A. Yes.

20 Q. Okay. Are those X/Q values accident X/Q
21 values or X/Q values used for evaluating the effects from
22 normal operations of Clinch River?

23 A. Really, they are both. The table includes
24 conservative X/Q's which would be used in the accident
25 calculations, and it also includes an annual average value,

1 which would be used in calculating the radiological effects
2 of normal releases.

3 Q Okay. Just to be clear, the first one, two,
4 three, four, five values, zero to two hours, zero to eight,
5 eight to twenty-four hours, one to four days and four
6 to thirty days values for X/Q in Table 1 of Appendix F,
7 those are the accident X/Q values?

8 A Yes, sir. They are exactly the same numbers
9 which appear in Section 2.3 of the Applicants' Preliminary
10 Safety Analysis Report.

11 Q And the last value, the "annual average," is
12 the X/Q value used for normal operations of Clinch River?

13 A Yes. That value is actually evaluated at
14 about 1800 feet, near a site boundary.

15 Q Turning to the FES, do you have that in front
16 of you?

17 A I believe I have. I've got Volume 2.

18 Q FES Supplement.

19 A I've got Volume 2.

20 MR. MIZUNO: Can you provide the witness
21 with Volume 1?

22 MR. EDGAR: Do you need both volumes?

23 MR. MIZUNO: No, just Volume 1.

24 BY MR. MIZUNO:

25 Q Turning to Chapter 9, Page 9-13.

1 A. Okay, I'm there.

2 Q. This shows Table A.9.4.

3 A. Yes.

4 Q. Does that table appear to combine information
5 given in the Environmental Report, Table 3, Appendix G,
6 and Table 8, Appendix F?

7 A. I would have to doublecheck the numbers, but
8 I know that they are a compilation of the two cost
9 tables which appear in my Appendices F and G, that the
10 Staff has pulled those numbers and reproduced them in an
11 integrated fashion.

12 Q. Okay. Looking at Item 1, "Escalation," and
13 do you recall the discussion involving what escalation is?

14 Could you give a description of what
15 "escalation" is, that item is in this table, as you
16 understand it?

17 A. Okay. The best thing I can do is reference you
18 back to the explanation of that line item, which appears
19 on Page G-29.

20 Essentially, the \$601 million number here is
21 based on the fact that we estimated through October 1,
22 1982, the project had spent \$1.3 billion; and of the 3.2
23 estimated project cost at that time, that left \$1.9 billion
24 yet to be spent after October 1, 1982.

25 The fact that the expenditure of that

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\$1.9 billion would be spent over an additional 43-month period, which is the reference delay case for moving to an alternative site, the addition -- that 43-month postponement in the spending of that money, calculated at 8 percent escalation rate, one would come up with a \$601 million cost.

- - -

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hop

9-1

1 Q In essence, that eight percent escalation rate
2 is essentially to take care of inflation?

3 A Yes, sir, and it's to translate the number
4 into the year of expenditure dollar, which accounts for
5 the inflation between now and the time it is spent.

6 Q Okay.

7 Now, the concept of escalation or inflation
8 -- whatever you want to call it -- is that the same
9 or is that a different concept from the year of
10 expenditure dollar?

11 Or to put it another way, is it your
12 understanding that the year of -- an adjustment for
13 year of expenditure is to take into account the time cost
14 of money and not take into account inflation?

15 A I guess I'm confused.

16 Q Okay. Perhaps you could just give me an
17 explanation of what your understanding of --

18 A My understanding is, that year of expenditure
19 dollars is a label for accounting for the inflation or
20 the cost of money as it raises through time and we have
21 used eight percent per year.

22 That is to say that a hundred dollars today
23 at an eight percent interest rate, next year is going to
24 be -- the equivalent would be \$108.000.

25 Hence, if I were to give you -- instead of

9-2

1 spending the hundred dollars today, this year, and I wanted
2 to ask you for it next year, to be able to do the same
3 thing with that hundred dollars, I'd have to ask you for
4 \$108.00 next year.

5 Q Okay. Finally.

6 Do you recall your discussion in response to
7 Dr. Hand's comments on the striped bass?

8 A Yes.

9 Q And you stated that the striped bass is an
10 introduced species.

11 A That is my understanding, yes.

12 Q Is that species endangered or threatened?

13 A No, sir.

14 Q Is the concern about the effects of the
15 thermal plume of Clinch River operation on striped bass
16 come from the fact that striped bass is part of the sport
17 fishery?

18 A I believe that is correct.

19 MR. MIZUNO: Staff has no further questions.

20 JUDGE MILLER: Anything on redirect?

21 MR. EDGAR: No redirect.

22 JUDGE MILLER: Okay. Thank you.

23 MR. EDGAR: I think Judge Linenberger has some
24 questions.

25 JUDGE LINENBERGER: I'm going to be brief

9-3
1 today. I think this has been an excellent discussion,
2 Mr. Kripps, and you have been most helpful.

3 I just wanted to find out one little thing.

4 BOARD EXAMINATION

5 BY JUDGE LINENBERGER:

6 Q On Page 8 there is a comment about the
7 examination that the Applicants have made and concluded
8 that there would be substantially increased project costs
9 at another site. These we have been talking about.

10 But can you tell us approximately when that
11 study was completed?

12 That's really all I want to know.

13 A Those numbers have been updated in 1982.

14 Q They were updated this year?

15 A Yes, sir.

16 Q All right.

17 That was the only question I had, was how
18 current.

19 JUDGE LINENBERGER: Thank you very much.

20 JUDGE MILLER: Thank you, sir.

21 You are dismissed.

22 (Witness excused.)

23 JUDGE MILLER: Next witness.

24 MR. EDGAR: Mr. Chairman, I would like to make
25 an offer of Applicants Exhibit 45 into evidence.

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JUDGE MILLER: Any objection?

MR. TOUSLEY: No objection.

MR. MIZUNO: No objection..

JUDGE MILLER: It may be admitted.

(The document heretofore
marked for identification
as Applicants Exhibit No. 45,
was received in evidence
and follows.)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
UNITED STATES DEPARTMENT OF ENERGY)
)
PROJECT MANAGEMENT CORPORATION)
)
TENNESSEE VALLEY AUTHORITY)
)
(Clinch River Breeder Reactor Plant))

Docket No. 50-537

APPLICANTS' DIRECT TESTIMONY
CONCERNING INTERVENORS' CONTENTIONS 5a) and 7c)

Dated: November 1, 1982

NUCLEAR REGULATORY COMMISSION

Docket No. 50-537 Official Ex. No. 45

In the matter of Clinch River

Staff _____ IDENTIFIED

Applicant RECEIVED

Intervenor _____ REJECTED _____

Cont'g Off'r _____

Contractor _____ DATE 11-19-82

Other _____ Witness Kripps

Reporter mt

Q.1. Please state your name and affiliation.

A.1. My name is Lawrence J. Kripps. I am presently employed by Energy Incorporated in Seattle, Washington.

Q.2. Have you prepared a statement of your professional qualifications?

A.2. Yes. A copy is attached to this testimony.

Q.3. What subject matter does this testimony address?

A.3. The intervenors, Natural Resources Defense Council, Inc. (NRDC) and the Sierra Club, contentions concerning the Applicants' alternative siting analyses. These contentions are:

CONTENTION 5

Neither Applicants nor Staff have established that the site selected for the CRBR provides adequate protection for public health and safety, the environment, national security, and national energy supplies; and an alternative site would be preferable for the following reasons:

- a) The site meteorology and population density are less favorable than most sites used for LWRs.
 - (1) The wind speed and inversion conditions at the Clinch River site are less favorable than most sites used for light-water reactors.
 - (2) The population density of the CRBR site is less favorable than that of several alternative sites.
 - (3) Alternative sites with more favorable

meteorology and population characteristics have not been adequately identified and analyzed by Applicants and Staff. The analysis of alternative sites in the ER and the Staff Site Suitability Report gave insufficient weight to the meteorological and population disadvantages of the Clinch River site and did not attempt to identify a site or sites with more favorable characteristics.

- b) Since the gaseous diffusion plant, other proposed energy fuel cycle facilities, the Y-12 plant and the Oak Ridge National Laboratory are in close proximity to the site an accident at the CRBR could result in the long term evacuation of those facilities. Long term evacuation of those facilities would result in unacceptable risks to the national security and the national energy supply.¹

CONTENTION 7

Neither Applicants nor Staff have adequately analyzed the alternatives to the CRBR for the following reasons:

- c) Alternative sites with more favorable environmental and safety features were not analyzed adequately and insufficient weight was given to environmental and safety values in site selection.
- (1) Alternatives which were inadequately analyzed include Hanford Reservation,

¹ Contention 5b) is addressed by the Applicants in separate testimony (Applicants' Direct Testimony Concerning Intervenor's Contention 5b), dated November 1, 1982) where it is demonstrated that the presence of the CRBRP in the vicinity of the Oak Ridge Gaseous Diffusion Plant (ORGDP), Y-12, and the Oak Ridge National Laboratory (ORNL) presents no unacceptable risks to the national security or the national energy supply. This conclusion confirms the assessment made during the course of the alternative siting analyses that the nearby presence of these facilities to the Clinch River site is not a significant factor affecting the selection of the site for the LMFBR Demonstration Plant.

- 4 -

Idaho Reservation (INEL), Nevada Test Site, the TVA Hartsville and Yellow Creek sites, co-location with an LMFBR fuel reprocessing plant (e.g., the Development Reprocessing Plant), an LMFBR fuel fabricating plant, and underground sites.

Q.4. In general terms, what analyses were performed and what conclusions were drawn concerning selection of a site for the LMFBR Demonstration Plant?

A.4. The Applicants' alternative siting analyses for the LMFBR Demonstration Plant have considered alternative sites from within the TVA power service area and nationwide from land in the custody of DOE. In addition, potential sites on land in the custody of TVA outside of its power service area have been evaluated, and the siting concepts of co-location with an LMFBR reprocessing or fuel fabrication plant and underground siting have been examined. All of these alternative siting analyses are contained in the CRBRP Environmental Report.² As a result of the Applicants' alternative siting analyses, all of which have been recently re-examined and updated, the conclusion reached was that the Clinch River site is the preferred site for the LMFBR Demonstration Plant.

² For ease of reference a bound copy of the pertinent CRBRP Environmental Report sections and appendixes containing the Applicants' alternative siting analyses are offered as an Exhibit to this testimony.

Q.5. What analyses were performed and what conclusions were drawn by the Applicants concerning sites within the TVA power service area?

A.5. The original alternative siting analysis that selected the Clinch River site as the preferred location for the LMFBR Demonstration Plant is contained in Section 9.2 and Appendix A of the Applicants' Environmental Report. In this analysis the TVA power service area was considered as the region of interest. In 1982 the original alternative siting analysis was re-examined and updated. The updated analysis is contained in Environmental Report Appendix G and confirmed the findings of the original analysis that from among sites within the TVA power service area the Clinch River site is the preferred site.

The original alternative siting analysis in Environmental Report Section 9.2 and Appendix A considered two distinct plant/site approaches:

- a. A hook-on nuclear island at an existing TVA steam plant site, and
- b. An all-new plant at a site within the TVA power service area.

The evaluation covering potential hook-on and new sites ultimately led to a detailed analysis comparing two hook-on sites (i.e., John Sevier and Widows Creek) and a new site on the Clinch River. The comparison of these

three candidate sites led to the conclusion that an all new plant at the Clinch River site was the preferred alternative.

The Applicants, in 1982, updated the original alternative siting analysis (see Environmental Report Appendix G) using the approach set forth in NRC's Proposed Rule on Alternative Sites (45 FR 24168-24178, April 9, 1980) and considering available new information. The updated analysis first demonstrated that the TVA power service area was an appropriate "region of interest". Secondly, it concluded that the TVA sites considered in the original analysis constitute a sufficient number of candidate sites that meet the Proposed Rule's threshold criteria and represent the environmental diversity of the TVA power service area. Thirdly, the Applicants' concluded that the addition of applicable current information would not change the previous conclusions in Environmental Report Section 9.2 and Appendix A that the Clinch River site is the preferred location for the LMFBR Demonstration Plant.

The Applicants in 1982 also performed as part of the update to the original alternative siting analysis, a separate, additional analysis of eleven candidate sites which are representative of the best sites within the TVA power service area (see Environmental Report Appendix G,

Attachment 1). These eleven sites were the proposed Clinch River site and the ten alternative candidate sites of Spring Creek, Blythe Ferry, Caney Creek, Taylor Bend, Buck Hollow, Phipps Bend, Lee Valley, Murphy Hill, Hartsville, and Yellow Creek. Except for the Yellow Creek site, all of the alternative candidate sites had been considered as new sites in the original alternative siting analysis. The comparison of the Clinch River site to the ten alternative candidate sites was done in accordance with the first part of the Proposed Rule's two part sequential analytical test by giving primary consideration to hydrology, water quality, aquatic biological resources, terrestrial resources, water and land use, socioeconomics, and population. In addition, the Applicants' analysis included a comparison of the meteorological (atmospheric dispersion) characteristics of the candidate sites. From this comparison it was concluded that none of the ten alternative candidate sites were environmentally preferable to the Clinch River site.

Although based on the conclusion that none of the ten alternative candidate sites were environmentally preferable to the Clinch River site there would be no requirement to proceed to the second part of the Proposed Rule's two part sequential analytical test, the Applicants nonetheless examined project economic, technology, and

institutional factors that affect the selection of the LMFBR Demonstration Plant site. This examination concluded that there would be substantially increased Project costs at another TVA site and that the LMFBR program timing objective (i.e., construction and operation of the LMFBR Demonstration Plant as expeditiously as possible) could not be met at any alternative TVA site. Thus, the updated alternative siting analysis presented in Appendix G of the Environmental Report concluded that no environmentally preferred site and certainly no obviously superior site exists in the TVA power service area for the LMFBR Demonstration Plant.

Based on the original and updated alternative siting analyses contained in Environmental Report Section 9.2 and Appendix A and Appendix G, respectively, the Applicants concluded that the Clinch River site is the preferred site for the LMFBR Demonstration Plant within the TVA power service area.

Q.6. What analyses were performed and what conclusions were drawn by the Applicants concerning alternative sites within DOE's custody?

A.6. The Applicants' alternative siting analyses examining sites within DOE's custody are presented in Section 2.1 of Appendix D and in Appendix E of the Environmental Report.

These analyses were updated in 1982 and the update is provided in Appendix F to the Environmental Report. The analyses in Environmental Report Appendixes D, E, and F concluded that none of the DOE sites are a substantially better alternative to the Clinch River site, and thus the Clinch River site is the preferred site for the LMFBR Demonstration Plant.

The analyses of DOE sites started with an inventory of U.S. Government owned land in the custody of DOE. A screening process eliminated from further consideration all but three sites. Factors used to screen out the other DOE sites included, for example, lack of available cooling water, high surrounding population density, and insufficient land. The Hanford Reservation, Savannah River Plant, and Idaho National Engineering Laboratory (INEL) were the three DOE sites resulting from this screening process found to be feasible for location of the LMFBR Demonstration Plant.

Based on an examination of the environmental and engineering characteristics of the Hanford, Savannah River, and INEL sites, it was found that these sites have somewhat more favorable atmospheric dispersion and site isolation (i.e., minimum exclusion boundary distance, surrounding population density) characteristics than the

Clinch River site. The comparison of other siting parameters showed the Hanford, Savannah River, INEL, and Clinch River sites to be essentially equivalent. An examination of economic and institutional factors determined that relocation of the LMFBR Demonstration Plant to the Hanford, Savannah River, or INEL site would substantially increase the Project costs and that at all three sites the LMFBR program objectives of extensive utility participation and timing (i.e., construction and operation of the LMFBR Demonstration Plant as expeditiously as possible) could not be met. Based on these analyses it was concluded that none of the DOE sites were a satisfactory alternative to the Clinch River site and, therefore, the Clinch River site remained the preferred site for the LMFBR Demonstration Plant.

Q.7. Were any other sites considered beside those already discussed?

A.7. The Applicants have also reviewed land owned by TVA outside its power service area for potential sites for the LMFBR Demonstration Plant. Only two potential sites were identified. Upon evaluation of the general characteristics of these sites, both sites were judged to be less desirable than the Clinch River site. (See Section 2.2 of Appendix D and Section 2.2 of Appendix F to the Environmental Report.)

Q.8. Were any other siting concepts considered by the Applicants in their site selection analyses?

A.8. The Applicants examined the concepts of co-location of the LMFBR Demonstration Plant with an LMFBR reprocessing or fuel fabrication plant and underground siting (see Environmental Report Appendix D, Section 2.3). A comparison of the safety, environmental acceptability, safeguards, and economics of an LMFBR Demonstration Plant utilizing these concepts, and consideration of LMFBR programmatic objectives, showed that neither co-location nor underground siting would be a desirable alternative. In the alternative siting analysis update provided in Section 2.3 of Appendix F to the Environmental Report, it was concluded that no new information had been developed since the 1976 analysis to change the previous conclusion that neither the concept of co-location or underground siting offers tangible improvement in the safety, environmental acceptability, safeguards, or economics of the proposed CRBRP.

Q.9. What factors were considered in the Applicants' alternative siting analyses?

A.9. The Applicants' alternative siting analyses included consideration of pertinent environmental, engineering, and economic factors and LMFBR programmatic objectives. Among

the siting factors considered were meteorology (atmospheric dispersion) and population.

Q.10. How was meteorology considered as a siting factor?

A.10. The comparison of meteorology between alternative sites was done using atmospheric dispersion as the pertinent siting characteristic. For alternative candidate sites within the TVA power service area the site comparison criteria for meteorological considerations related primarily to atmospheric diffusion conditions, including opportunity for dilution before released effluents would be expected to reach communities within ten miles of the site and local stagnation potential. In addition, the relative difficulty in determining and describing transport and diffusion patterns of effluent and the confidence levels in transport and diffusion estimates were compared (see Environment Report Appendix G, Attachment 1, Section B). For sites within the TVA power service area the evaluation was qualitative because of the varying type and amount of data available at each site. The comparison of alternative DOE sites (i.e., Hanford Reservation, Savannah River, and INEL) to the Clinch River site was quantitative using conservative and annual average X/Q values.

Q.11. How was population considered as a siting factor?

A.11. The population and the population density surrounding candidate sites within the TVA power service area and the three DOE sites were compared in the alternative siting analyses. In addition to the comparison of population data between sites, population density data at each alternative site were compared to the NRC guidelines provided in Regulatory Guide 4.7 "General Site Suitability Criteria for Nuclear Power Stations."³ The NRC population density guidelines were found to be met for the Clinch River site, for all alternative sites considered within the TVA power service area, and for the three DOE sites.

Q.12. Based on the consideration of meteorological and population characteristics, what conclusions were drawn?

A.12. The comparison of meteorological (i.e., atmospheric dispersion) and population characteristics showed that some of the alternative candidate sites within the TVA

³ The NRC guidelines in Regulatory Guide 4.7 concerning population considerations state:

If the population density, including weighted transient population, projected at the time of initial operation of a nuclear power station exceeds 500 persons per square mile averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at that distance), or the projected population density over the lifetime of the facility exceeds 1,000 persons per square mile averaged over any radial distance out to 30 miles, special attention should be given to the consideration of alternative sites with lower population densities.

power service area possessed certain advantages over the Clinch River site and that all three potential DOE sites had lower population densities and more favorable atmospheric dispersion characteristics compared to the Clinch River site. This would result in lower off-site doses associated with releases of radioactive material from the LMFBR Demonstration Plant at these alternative sites. The reduction in calculated doses at these alternative sites, however, does not represent a significant difference in terms of expected environmental impact. The Applicants' testimony concerning NRDC Contentions 1, 2, and 3 showed that the doses at the Clinch River site for the site suitability source term (SSST), which were greater than those associated with the design basis accidents, were well below the 10CFR Part 100 dose guidelines. This testimony also showed that CRBRP can be designed so that greater accident consequences are highly unlikely. In addition, under normal operation, the Applicants' testimony concerning NRDC Contentions 11b) and 11c) shows that the health effects to the public from operation of CRBRP are small in relation to the background incidence of health effects in the population. Consequently, the real reduction in expected environmental impacts for an alternative site relative to the Clinch River site because of lower population density and/or more favorable atmospheric dispersion characteristics is judged

to be insignificant.

The effect of this conclusion was that while the atmospheric dispersion and population characteristics were more favorable at Hanford, Savannah River, and INEL compared to the Clinch River site and at several of the alternate candidate sites within the TVA power service area, these factors alone did not make these sites environmentally preferable to the Clinch River site. In fact, on consideration of all pertinent environmental siting factors, none of the three potential DOE sites or the ten alternative candidate sites within the TVA power service area were found to be environmentally preferable to the Clinch River site.

Q.13. What are your conclusions regarding Contentions 5a) and 7c)?

A.13. As discussed above, the Applicants have analyzed a range of alternative sites and siting concepts for the LMFBR Demonstration Plant that include the alternative sites and siting concepts specifically mentioned in Contention 7c). The Applicants' alternative siting analyses have considered the pertinent environmental, engineering, economic factors and LMFBR programmatic objectives, including meteorology (atmospheric dispersion) and population. Based on these alternative siting analyses, the Clinch River site is the preferred location for the

LMFBR Demonstration Plant.

STATEMENT OF QUALIFICATIONS

Lawrence J. Kripps
Energy Incorporated
Seattle, Washington 98031

I received Bachelor of Science and Master of Science degrees in Nuclear Engineering from the University of Wisconsin, Madison, in 1971 and 1972. During the summers of 1968 through 1971 while attending the University of Wisconsin, I worked as an engineer at the Allen S. King Plant, Monticello Nuclear Plant, and Prairie Island Nuclear Plant, respectively, where my responsibilities included testing plant performance and conducting pre-operational tests. While attending graduate school I was a teaching assistant for undergraduate and graduate courses in nuclear reactor analysis.

Upon graduating from the University of Wisconsin, I joined the Tennessee Valley Authority in 1972 as a nuclear engineer in the Power Research Staff of the Office of Power. From October 1972 to March 1973 I was temporarily assigned as a test engineer at the Brown's Ferry Nuclear Power Plant where I prepared and conducted several pre-operational tests. After Brown's Ferry I worked in the LMFBR Branch of the Power Research Staff principally supporting the CRBRP Project. As a member of the LMFBR Branch I helped to prepare the CRBRP Environmental

Report and Preliminary Safety Analysis Report (PSAR). I specifically assisted in the preparation of Environmental Report Section 9.2 concerning site selection.

In 1975 I was reassigned by TVA to the CRBRP Project Office as a licensing engineer in the Licensing Branch of the Public Safety Division. My responsibilities included overall responsibility for the CRBRP Environmental Report and Chapter 2.0 of the PSAR and for acquisition of all non-NRC permits required for CRBRP construction and operation. In this capacity, I conducted the supplemental alternative siting analysis of alternative DOE sites, TVA owned sites outside the TVA power service area, and the concepts of underground siting and co-location with an LMFBR fuel reprocessing or fuel fabrication plant. In 1977 I became Chief of the Licensing Branch with overall responsibility for CRBRP licensing activities.

From 1979 to the present I have been employed by Energy Incorporated (EI) as a Senior Analyst and Project Manager. At EI, under a contract with Westinghouse Electric Corporation, I have continued to support the CRBRP Project licensing effort by providing or assisting in providing updates to the previous CRBRP alternative siting analyses.

TABLE OF CONTENTS FOR THE ENCLOSED
CRBRP ENVIRONMENTAL REPORT SECTIONS AND APPENDIXES THAT
CONTAIN THE APPLICANTS' ALTERNATIVE SITING ANALYSES

Section 9.2 ALTERNATIVE SITES AND PLANT ARRANGEMENTS

(The original alternative siting analysis considering the TVA power service areas as the region of interest)

Appendix A TENNESSEE VALLEY AUTHORITY RESPONSE TO ATOMIC ENERGY COMMISSION QUESTION 340.1 (9.2.4) ALTERNATIVE SITES (Additional information on new TVA sites provided in support of the original alternative siting analysis presented in Section 9.2)

Appendix D SUPPLEMENTAL ALTERNATIVE SITING ANALYSIS FOR THE LMFBR DEMONSTRATION PLANT

(The Applicants alternative siting analysis considering ERDA (DOE) sites (Section 2.1), TVA owned sites outside the TVA power service area (Section 2.2), and the concepts of co-location and underground siting (Section 2.3))

Appendix E ADDITIONAL INFORMATION REGARDING CONSIDERATION OF

ALTERNATIVE SITES FOR THE LMFBR DEMONSTRATION PLANT
(Additional information provided in response to NRC
questions concerning the analysis of ERDA (DOE)
sites in Appendix D.

Appendix F SUPPLEMENTAL ALTERNATIVE SITING ANALYSIS UPDATE FOR
THE LMFBR DEMONSTRATION PLANT
(Update to Appendixes D and E which examined
alternative sites from among DOE sites, TVA sites
outside the TVA power service area, and the concepts
of co-location and underground siting)

Appendix G UPDATE TO THE CRBRP ALTERNATIVE SITING ANALYSIS
WITHIN THE TVA POWER SERVICE AREA
(Update to the original alternative siting analysis
presented in Section 9.2 and Appendix A considering
the TVA power service area as the region of
interest)

9-5

1 MR. MIZUNO: I believe the Staff is presenting
2 its next panel. I wonder if we could take a short break
3 to prepare --

4 JUDGE MILLER: Yes. We will take a short
5 recess.

6 Let the record show, by the way, that
7 Intervenor's Counsel has supplied a choice copy of Exhibit
8 14 that was used, I think, or least developed in the
9 cross-examination of Dr. Cochran yesterday and that the
10 Staff has apparently handed out a copy of Executive Order
11 No. 12114, dated January 4, 1979, which was alluded in
12 discussion with Counsel yesterday.

13 I assume copies have been furnished to the
14 Reporter.

15 Whereupon,

16 CHARLES FERRELL

17 was called as a witness by Counsel for the Regulatory Staff,
18 having first been duly sworn by the Chairman, was examined
19 and testified as follows:

20 and Whereupon,

21 HOMER LOWENBERG

22 was recalled as a witness by Counsel for the Regulatory
23 Staff, having previously been duly sworn by the Chairman,
24 was examined and testified further as follows:
25

1 and Whereupon,

9-6

2 LEONARD SOFFER

3 was called as a witness by Counsel for the Regulatory
4 Staff, having first been duly sworn by the Chairman, was
5 examined and testified as follows:

6 and Whereupon,

7 IRWIN SPICKLER

8 was recalled as a witness by Counsel for the Regulatory
9 Staff, having previously been duly sworn by the Chairman,
10 was examined and testified further as follows:

11 and Whereupon,

12 PAUL LEECH

13 was called as a witness by Counsel for the Regulatory
14 Staff, having first been duly sworn by the Chairman, was
15 examined and testified as follows:

16 DIRECT EXAMINATION

17 BY MR. MIZUNO:

18 Q Gentlemen, could you identify yourselves for
19 the record, and when answering questions, since there are
20 only three microphones, could you move the microphones
21 to you whenever you have to answer a question?

22 Please identify yourselves.

23 BY WITNESS FERRELL:

24 A I am Charles Ferrell. I am a site analyst.
25

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BY WITNESS LEECH:

A. I am Paul Leech. I am project manager.

BY WITNESS SOFFER:

A. My name is Leonard Soffer. I am a Section Leader of the Site Analysis Section.

BY WITNESS SPICKLER:

A. I am Irwin Spickler. I am the Section Leader of the Meteorological Section of the NRC.

BY WITNESS LOWENBERG:

A. I am Homer Lowenberg. I am Chief Engineer of the Office of the Nuclear Material Safety and Safeguards of the NRC.

Q. Messrs. Ferrell, Lowenberg, Soffer and Spickler, do you have in front of you a document entitled Joint Testimony of Charles Ferrell, Homer Lowenberg, Leonard Soffer and Irwin Spickler on Contentions 5(e) and 7(c)?

BY WITNESS FERRELL:

A. Yes.

BY WITNESS LOWENBERG:

A. Yes.

BY WITNESS SOFFER:

A. Yes.

BY WITNESS SPICKLER:

A. Yes.

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1 MR. MIZUNO: Mr. Chairman, I'd like to have
2 that document marked as Staff Exhibit No. 15, for
3 identification.

4 JUDGE MILLER: It will be marked Staff Exhibit
5 15, for identification.

6 (The document referred to
7 was marked Staff Exhibit
8 No. 15 for identification.)

9 BY MR. MIZUNO:

10 Q Gentlemen, do you have any corrections to make
11 to this document at this time?

12 Starting with Mr. Ferrell.

13 BY WITNESS FERRELL:

14 A No, sir.

15 Q Mr. Lowenberg?

16 BY WITNESS LOWENBERG:

17 A Yes, I do.

18 I have two corrections to one sentence.

19 On Page 30 of the Exhibit, the last sentence
20 that continues over onto Page 31.

21 The sentence should be changed, as follows:

22 It should read:

23 "This advantage --"

24 rather than, "these advantages". Singular rather than
25 plural. That's the first correction.

9-9

1 The second correction is, the sentence should
2 be inserted in the text at Line 10 of Answer No. 55,
3 rather than the place in the text where it is and that
4 would come between the sentence that reads:

5 "The co-location of a nuclear
6 power reactor with fuel cycle
7 facilities would only decrease
8 the shipment distances of a small
9 amount of fresh and spent fuel."

10 Then this sentence should be inserted there.

11 JUDGE HAND: Which sentence?

12 WITNESS LOWENBERG: The one I just corrected.
13 The one at the bottom of the page and continuing on the
14 next page.

15 Is that clear?

16 BY MR. MIZUNO:

17 Q Mr. Soffer.

18 BY WITNESS SOFFER:

19 A Yes. I have one correction on Page 21, the
20 last line of Answer No. 40, should read:

21 "One thousand persons per square
22 mile out to thirty miles."

23 The word "of" is replaced by the word "to".

24 That's all that I have.

25 Q And Mr. Spickler, do you have any corrections?

9-10

1 BY WITNESS SPICKLER:

2 A Yes, I have several corrections.

3 The first ones are on Page 7, the answer to
4 Question 11, seventh line down, the sentence that starts:

5 " "The 110 meter --"

6 That sentence should be corrected to read:

7 "The 110 and 10 meter -- "

8 and the next word should be plural--

9 " -- towers --"

10 and the word after that should be:

11 " -- were --"

12 The next sentence:--

13 "The 10 meter tower instrumentation --

14 Q. Can you slow down just a bit?

15 BY WITNESS SPICKLER:

16 A. Sure.

17 Did you get that first change?

18 The second change is in the next sentence:

19 "The 10 meter tower

20 instrumentation as previously

21 said consisted of -- "

22 It should read:

23 " -- consists of --"

24 And on the bottom line of the page, cross out the words
25 "atmospheric pressure".

9-11 1

2 On Page 9, the last line of the first
3 partial paragraph on the top of the page. The first
4 number should be "25", not 35.

5 Page 10, there is a large paragraph in the
6 middle of the page, the tenth line down, it says:

7 "The maximum section -- "

8 That should be:

9 "The maximum sector --".

10 And on Page 13, the fourth column, the title
11 should be:

12 "Source of Data"

13 And the top number in Column 3 should be:

14 " 2.1"

15 not "4.4".

16 And on Page 15, after the word "and", on the
17 top line -- it says:

18 " -- and average stability --"

19 That should read:

20 " -- and comparable average stable
21 wind speeds, except for Clinch
22 River."

23 That's it.

24 BY MR. MIZUNO:

25 Q All right.

Mr. Spickler, did this error affect the
✓

1 calculations of the X/Q values for Clinch River?

2 BY WITNESS SPICKLER:

3 A. No, it does not.

4 Q. This was just a typographical error?

5 BY WITNESS SPICKLER:

6 A. Which?

7 Q. The average wind speed for Clinch River,
8 contained on Page 13?

9 BY WITNESS SPICKLER:

10 A. No, it was not a typographical error.

11 In putting the table together, a mistake was
12 made with regard to conversion of units. So that was
13 a error of ommission.

14 Q. Thank you.

15 Gentlemen, as corrected, does this testimony
16 represent your testimony in this proceeding?

17 BY WITNESS FERRELL: '

18 A. Yes, it does.

19 BY WITNESS LOWENBERG:

20 A. Yes, it does.

21 BY WITNESS SOFFER:

22 A. Yes, it does.

23 BY WITNESS SPICKER :

24 A. Yes, it does.

25 Q. Is it true and correct, to the best of your

1 knowledge and belief?

2 BY WITNESS FERRELL:

3 A Yes.

4 BY WITNESS LOWENBERG:

5 A Yes.

6 BY WITNESS SOFFER:

7 A Yes.

8 BY WITNESS SPICKLER:

9 A Yes.

10 Q Mr. Leech, do you have in front of you the
11 document entitled NRC Staff Testimony of Paul Leech
12 on Contention 7(c)?

13 BY WITNESS LEECH:

14 A Yes, I do.

15 MR. MIZUNO: Chairman Miller, I would like to
16 have that document identified or marked for
17 identification as Staff Exhibit No. 16.

18 JUDGE MILLER: It may be marked.

19 (The document referred to
20 was marked Staff Exhibit
21 No. 16 for identification.)

22 BY MR. MIZUNO:

23 Q Mr. Leech, do you have any corrections to make
24 to your testimony at this time?

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9-14

BY WITNESS LEECH:

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A. Yes, I do.

On Page 2 of Answer 4, the second from the bottom sentence. It starts out:

The eleven sites identified by --"
and then the next line goes on and the at the end of the line it says:

" -- Clinch River, -- "

and then the words Lee Valley, L-e-e V-a-l-l-e-y,

" -- Lee Valley, -- "

should be inserted there.

Page 7, Answer 11, the next to the last line of that answer it says: " -- stand-along --"

That should be "stand-alone".

Q. Mr. Leech, this is the second to the last line of Answer 11?

BY WITNESS LEECH:

A. Yes.

It starts out:

" -- stand-along --"

Q. So the "g" should be deleted and replaced with an "e"?

BY WITNESS LEECH:

A. That's correct.

Page 10, Question 18, in the first line, after the word "respect", insert the word "to".

1 "What were the Applicants' conclusions
2 with respect --" after "respect", "to".

9-15

3 On Page 16, in the Answer 28, second paragraph,
4 there is a word "attribute", and it should be "attributed".

5 So it would read:

6 "The costs of delay attributed -- "

7 That's all the corrections.

8 Q As corrected, does this testimony represent
9 your testimony in this proceeding?

10 BY WITNESS LEECH:

11 A Yes, it does.

12 Q And is it true and correct to the best of your
13 belief?

BY WITNESS LEECH:

14 A Yes.

15 MR. MIZUNO: Chairman Miller, before I offer
16 the panel for cross examination, I would like to make a
17 statement as to their expert qualifications.

18 JUDGE MILLER: Very well.

19 MR. MIZUNO: Mr. Lowenberg is the Staff's
20 expert on co-location and question concerning that subject
21 should be directed to him.

22 Mr. Spickler is the Staff's expert on
23 meteorology.

24 Mr. Soffer and Mr. Ferrell are the Staff's
25 experts on population density and other demographic

1 factors.

9-16 2 In addition, Mr. Soffer will be testifying --
3 or he is the expert on the underground siting concept and
4 Mr. Leech is the environmental project manager and he was
5 responsible for the overall coordination of the
6 alternative site review by the Staff, so any procedural
7 questions, as well as questions generally regarding
8 alternative sites, should be directed towards him.

9 JUDGE MILLER: Thank you.

10 MR. MIZUNO: I will now proffer the panel
11 for cross-examination.

12 JUDGE MILLER: Cross-examination.

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CROSS-EXAMINATION

1 BY MR. TOUSLEY:

2 Q Well, just one question on jurisdiction
3 amongst you. Mr. Ferrell and Mr. Soffer, is there any
4 particular way you divvied up the population materials
5 or --

6 MR. MIZUNO: Excuse me. That's Mr. Soffer.

7 MR. TOUSLEY: Soffer. I'm sorry.

8 WITNESS SOFFER: Mr. Ferrell was responsible
9 for examining the data and evaluating the data with regard
10 to alternative sites.

11 I'm Mr. Ferrell's supervisor. I'm available
12 for questioning in regards to the NRC criteria --
13 population density criteria and how they were applied
14 in judging the alternative sites.

15 BY MR. TOUSLEY:

16 Q Mr. Leech, is it correct that in doing the
17 alternative siting analysis, generally, you used
18 reconnaissance-level information gleaned from environmental
19 impact statements for other facilities?

20 BY WITNESS LEECH:

21 A In part that's correct. That's where some
22 of the information came from.

23 Q In using that information for the alternative
24 facilities, did you make any attempt to determine whether
25 that information was up to date in your analysis?

1 BY WITNESS LEECH:

2 A. Yes.

3 Q. And what was the nature of that effort?

4 BY WITNESS LEECH:

5 A. Each of the specialists on our alternative
6 siting team -- in his own specialty became familiar with
7 the data in those various statements and from each
8 individual's -- each person's knowledge of those sites
9 and other information available about those sites, they
10 made appropriate considerations of the data presented.

11 Q. Can you tell me when these updates were done?

12 BY WITNESS LEECH:

13 A. Well, first, I need to advise you that these
14 people did not write new updated material. What they
15 did was consider how the data needed changes as they
16 went through the review from about one year ago up
17 until the time we completed this job recently.

18 That is, this document.

19 Q. Your answer was that the people who worked
20 on the review did do some updates. Did you personally do
21 any in your overall supervision of the work?

22 BY WITNESS LEECH:

23 A. Overall supervision of the alternative sites
24 material?

25 Q. Yes.

10-3

1 BY WITNESS LEECH:

2 A Yes. I had general discussions, evaluations --
3 where I was a party to those evaluations that had appeared
4 in the old FES.

5 And generally, you might say, directed the
6 overall effort.

7 Q How about material that appeared in the
8 environmental impact statements for the alternative sites?

9 BY WITNESS LEECH:

10 A No.

11 Q Mr. Leech, did you make any attempt to deter-
12 mine whether the environmental impact statements provided
13 information sufficient to cover the eight threshold
14 criteria from the proposed rule on alternative sites?

15 MR. MIZUNO: Could you identify --

16 MR. TOUSLEY: Yes. I'm speaking of the
17 proposed rule on alternative sites which appears at
18 Appendix K, Volume II of the supplemental --

19 MR. MIZUNO: I'm referring to -- Could you
20 identify the -- What environmental statements are you
21 referring to?

22 MR. TOUSLEY: The environmental statements
23 for Hartsville, Phipps Bend, Yellow Creek and Murphy
24 Hill.

25 WITNESS LEECH: Would you put that question

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again?

MR. TOUSLEY: Okay.

BY MR. TOUSLEY:

Q You're familiar, are you not, with the eight threshold criteria for candidate sites --

BY WITNESS LEECH:

A Yes.

Q -- in the proposed rule?

BY WITNESS LEECH:

A Yes.

Q -- which appear at Page K-9 of Volume II of the Supplemental FES.

Did you attempt to determine whether the information you used was sufficient to satisfy those eight threshold criteria for each site?

BY WITNESS LEECH:

A I personally did not.

Q Concerning aquatic biological effects at the various sites named -- consideration of that factor, how much weight was given to no-flow periods in the Clinch River in the alternative site analysis? Was it considered an important factor, or was very little weight given?

BY WITNESS LEECH:

A It received extensive consideration and review. In terms of weight, in trying to weigh various

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1 factors, all I can say there is the previous existence of
2 no-flow periods and what the current and projected pos-
3 sibilities are for such events was definitely considered
4 by the aquatic biologists.

5 Q And can you give me any indication how
6 significant that factor was in the comparison of alter-
7 natives?

8 BY WITNESS LEECH:

9 A Am I correct in assuming you are talking
10 about the expected impacts -- or anticipated impacts on
11 the biota?

12 Q Yes.

13 BY WITNESS LEECH:

14 A Is that what you mean?

15 Q Yes. As the no-flow periods would impact
16 on thermal discharge effects.

17 BY WITNESS LEECH:

18 A The predicted effects were analyzed and since
19 the expectation is that those no-flow periods are not
20 likely to exist for any extended periods of time in the
21 future, the ultimate outcome of that consideration was
22 that the no-flow periods would have no significant effect
23 on the aquatic biota.

24 JUDGE LINENBERGER: Excuse me, counsel. But
25 I'd like a clarification, Mr. Leech, with respect to your

1 answer to a previous question in which you indicated
2 to counsel that you did not personally involve yourself
3 in application or consideration of these eight threshold
4 criteria, that I believe you have opened there to Volume
5 II of the Final Supplement.

6 Did anyone under your direction, with respect
7 to this effort, consider those criteria?

8 WITNESS LEECH: Yes. Each of the team mem-
9 bers who were assigned specialists in these areas devoted
10 his attention to it.

11 JUDGE LINENBERGER: So the fact that you didn't
12 involve yourself personally in it does not mean they were
13 ignored; is that correct?

14 WITNESS LEECH: That's correct.

15 JUDGE LINENBERGER: Thank you.

16 BY MR. TOUSLEY:

17 Q Mr. Leech, is it correct that the impact on
18 striped bass from the Clinch River Breeder Reactor is as
19 yet undetermined?

20 BY WITNESS LEECH:

21 A No. I believe that in our analysis we indi-
22 cate that we do not expect an adverse impact on the
23 striped bass because of the fact there you have to have
24 several extreme circumstances occur simultaneously to
25 cause that kind of effect. It is true that, as you heard

1 from Mr. Kripps, that TVA has an ongoing program for
2 assessing and assuring that some better knowledge is
3 known of precise threshold areas.

4 But as far as our Staff is concerned, we have
5 at least reached a determination for the purposes of our
6 review here, but no significant impact is expected.

7 Q Is it correct that at numerous places in the
8 analysis of alternative sites, particularly in Appendix L,
9 you state that if it is not found that there will be
10 in significant impacts, that the Applicants would be
11 required to take measures to restrict their thermal dis-
12 charge to mitigate impacts on the striped bass?

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1 BY WITNESS LEECH:

2 A That's correct.

3 Q Is the NRC responsible for the corrective
4 measures that might be required to protect the striped
5 bass?

6 BY WITNESS LEECH:

7 A For requiring those corrective measures?

8 Q Yes.

9 BY WITNESS LEECH:

10 A Basically EPA is responsible for that. But,
11 undoubtedly, with some consultation with us.

12 Q Might these requirements, if they should need
13 to be used, affect the operation of the plant?

14 MR. MIZUNO: Objection. That's a speculative
15 question. The witness stated that that's EPA's domain.
16 I don't believe the record reflects anything concerning
17 that -- those mitigative measures.

18 MR. TOUSLEY: Well, Mr. Chairman --

19 JUDGE MILLER: You may answer.

20 WITNESS LEECH: Let me make sure I understand
21 your question. Would you say it again?

22 BY MR. TOUSLEY:

23 Q Might the requirements in the NPDES permit --
24 and I suppose I should spell that out for the record --
25 National Pollutant Discharge Elimination System under the

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1 Clean Water Act; that's the EPA's control; is that
2 correct?

3 BY WITNESS LEECH:

4 A Yes.

5 Q Okay. It states that if effects on the
6 striped bass are found not to be insignificant, the
7 operators of the plant will be required to restrict --
8 might be required to restrict thermal discharges at key
9 times; is that correct -- to mitigate those impacts?

10 MR. MIZUNO: A clarification there. There is
11 no final permit. I believe no permit has been issued.

12 MR. TOUSLEY: Well, the Appendix L repeatedly
13 speaks of NPDES requirements if this happened. The permit
14 is in draft form, and it cannot be final until the EIS
15 is final.

16 Yes, you're right. But it will be in about
17 a month; isn't that correct?

18 No mind. It's in the Appendix L repeatedly.

19 WITNESS LEECH: It is true that the discharge
20 from the plant could be affected by such a decision or
21 such a finding from EPA and TVA applicants.

22 Further research into the subject -- it's
23 more likely, however, that some other mitigating measure
24 would be taken to decrease the temperature of the dis-
25 charge without necessarily lowering the operating level.

1 BY MR. TOUSLEY:

2 Q Would reducing the temperature without reduc-
3 ing the operation level of the plant involve additional
4 expenditures of equipment?

5 BY WITNESS LEECH:

6 A Yes. It would probably, in my opinion, be
7 very unlikely.

8 Q Do you know what the costs of such a --

9 BY WITNESS LEECH:

10 A I do not know precisely.

11 Q Any range of possibilities?

12 BY WITNESS LEECH:

13 A Having never designed an additional cooling
14 mechanism for a plant, I really have not got a very good
15 appreciation of it. But I have discussed it enough with
16 people to understand that it probably would be minor.

17 Q In your testimony, Mr. Leech, at the bottom of
18 Page 5 and the top of Page 6, in discussing the five
19 chosen sites and the fact that they do not include an
20 alternative site on the Clinch River, as required by
21 the proposed rule on alternative sites, you state that
22 "The Staff found that this is not an important omission
23 because the aquatic impacts of such a site are unlikely
24 to be less than the proposed site."

25 Since you haven't considered the alternative

1 sites on the Clinch River, what is the basis for your
2 conclusion that they -- that impacts are unlikely to be
3 less?

4 BY WITNESS LEECH:

5 A. Well, basically, I think the same impacts
6 could be expected at most any location on the Clinch
7 River.

8 Q. Do you believe that generically the impacts
9 on various sites on the same water source would be un-
10 likely to be significantly different?

11 BY WITNESS LEECH:

12 A. I think that is true unless, of course, you
13 have a very diverse situation in that particular water
14 source that you are considering.

15 Q. Why do you suppose the proposed rule requires
16 that such sites be included among the candidates con-
17 sidered?

18 MR. MIZUNO: I would object to that question.
19 You're asking the witness to speculate as to the reason
20 for the proposed rule.

21 It has --

22 JUDGE MILLER: Well, is it beyond the witness'
23 competence?

24 MR. MIZUNO: Yes. I don't believe that Mr.
25 Leech was involved in the preparation of the proposed

10-12

1 rule.

2 JUDGE MILLER: In that event, it will be
3 sustained on that basis.

4 BY MR. TOUSLEY:

5 Q Mr. Leech, on Page 15 of your testimony,
6 Answer 27, you state that "A decision to relocate the
7 plant would result in avoidable delay," and that "That
8 would not be consistent with the Department of Energy's
9 timing objective on the LMFBR program."

10 Taking this consideration into account, would
11 it ever be possible for alternatives to be found obviously
12 preferable to preferred -- proposals where substantial
13 preparation had already been done for those preferred
14 proposals?

15 BY WITNESS LEECH:

16 A Yes, it would be possible.

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1 BY MR. TOUSLEY:

2 Q How?

3 BY WITNESS LEECH:

4 A There are many factors that are considered
5 in regard to comparing alternative sites. If you had
6 overwhelming preponderance of indications that some other
7 site was better than the proposed site, presumably you
8 would make a finding that that other site was substantially
9 better; and, therefore, you would be in the position of
10 making such a determination...

11 Q I'm sorry. Were you through?

12 BY WITNESS LEECH:

13 A I'm trying, again, to get the right word in
14 mind.

15 ...that the proposed site was not the correct
16 site.

17 Q So the alternative site would have to have
18 advantages which outweigh the disadvantage of avoidable
19 delay; is that correct?

20 BY WITNESS LEECH:

21 A True.

22 Q I would like you to turn to the Supplement to
23 the FES, Page 9-14 in Section 9.2. I'm speaking of the
24 Final Supplement.

25 /

1 BY WITNESS LEECH:

2 A. Yes.

3 Q. In Table A9.5 at the top of Page 9-14, you
4 indicate your projections of the cost of relocating the
5 breeder to an alternative site compared to the Clinch
6 River site.

7 For the DOE sites, Hanford, Idaho and
8 Savannah River, you give corresponding costs, additional
9 costs.

10 For the TVA alternatives, you have them
11 grouped somehow.

12 For the low range, you have indicated in the
13 last column, at the bottom of it, that the present worth
14 cost of moving to TVA alternatives in the low range would
15 only be about 1.1 or 1.2 percent more than the present
16 worth cost at Clinch River; is that correct?

17 BY WITNESS LEECH:

18 A. That's correct.

19 Q. And for the high range of TVA alternatives,
20 it's about 8.9 percent?

21 BY WITNESS LEECH:

22 A. Yes.

23 Q. Okay. Can you tell me which of the
24 alternative TVA sites correspond to those low-range values?
25 /

1 BY WITNESS LEECH:

2 A No, I can't.

3 Q How was this range derived?

4 BY WITNESS LEECH:

5 A Let me direct your attention to the previous
6 page. Table A9.4 provides the Applicants' estimates, in
7 which there is a column "Other TVA Sites," and some of
8 the numbers there are in ranges.

9 So at the bottom you would have "Total Cost
10 Impact" with a range.

11 Presumably, if I recollect this correctly,
12 the 809 would be construed at the low range and 1210 the
13 high range.

14 Q So your figures were taken directly from the
15 Applicants?

16 BY WITNESS LEECH:

17 A Yes, they were.

18 Q And you did not inquire of the Applicants how
19 they derived those ranges?

20 BY WITNESS LEECH:

21 A Yes, we did. We did discuss these numbers,
22 yes.

23 I should point out that the numbers in
24 Table A9.5 have been adjusted somewhat by the Staff, as
25 compared to the numbers in A9.4, and we've described

1-4 1 those numbers in the text.

2 If you'll go back to Page 9-12 and read that
3 narrative, you'll see the basis of those adjustments.

4 Q Things like the discount rate; is that what
5 you are referring to?

6 BY WITNESS LEECH:

7 A Well, not only that. I'm referring to the
8 revision of the Applicants' estimated revenue adjustment
9 for sale of power to reflect recent fuel cost statistics,
10 primarily, and then, of course, we have put it on a
11 present worth basis.

12 But even the year of expenditure dollars in
13 A9.5 do reflect the change, basically, from our idea of
14 what those revenue adjustments would be.

15 Q So you made some adjustments to the Applicants'
16 data, but you did not independently assess the validity
17 of those data; is that correct?

18 BY WITNESS LEECH:

19 A We attempted to do so.

20 Q By the concept code?

21 BY WITNESS LEECH:

22 A I beg your pardon?

23 Q You are referring to your attempt with the
24 concept code?

25 /

11-5
1 BY WITNESS LEECH:

2 A That and just getting a better understanding
3 of what went into these items so that we could see whether
4 we felt they were reasonable numbers.

5 As you say, the concept code is how we began.

6 Q And that effort you found unfruitful; is
7 that correct?

8 BY WITNESS LEECH:

9 A It did not seem entirely applicable to this
10 situation due to the differences in design between an
11 LMFBR plant and a normal lightwater reactor.

12 Q And what sort of analysis did you use instead
13 of the concept code?

14 BY WITNESS LEECH:

15 A We found we really could not make a complete
16 analysis of all of these cost items.

17 Q So you --

18 BY WITNESS LEECH:

19 A Those numbers, of course, are primarily --
20 well, I should say our concept run was really aimed at
21 developing a better verification of the over-all cost of
22 the Clinch River plant itself, and did not directly
23 pertain here to the different cost items that we are
24 talking about here.

25 So that in the context of alternative siting,

1-6
1 we really found ourselves more examining some of these
2 items and, as I say, leaning more on whether we felt these
3 were logical numbers that were attributed to it.

4 Q What is your understanding of the difference
5 between the approximately one percent difference for the
6 low TVA sites and the approximately nine percent difference
7 for the high TVA sites?

8 What accounts for that?

9 BY WITNESS LEECH:

10 A Well, basically, it relates to our putting
11 on -- well, it relates to the costs that I referred to
12 earlier for the other TVA sites that are in A9.4.

13 There are a number of items there where you have
14 a range, and that's where the ranges come from basically
15 over here in Table A9.5.

16 Q So your understanding is that those were the
17 ranges that were provided by the Applicants?

18 BY WITNESS LEECH:

19 A Yes.

20 Q At the bottom of Page 9-14, the same page,
21 you cite the Applicants' conclusion that, "The key
22 parameters of an updated cost/benefit analysis, such as
23 commercial breeder introduction dates and future nuclear
24 capacity, are so uncertain that the value of such an
25 analysis (that is, cost benefit analysis) would be

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questionable, and that the evaluation in the FES is not
current, but any attempt to update it would be
speculative."

Are the costs involved in this analysis
speculative?

BY WITNESS LEECH:

A. I really don't know.

- - -

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Q What is the basis for your conclusion that an attempt to update the cost/benefit analysis would be speculative?

BY WITNESS LEECH:

A Well, first of all, we are talking about programmatic considerations here basically that are related to value of the LMFBR program; and since there has been no attempt -- well, apparently no attempt, at least that we see in the Programmatic Statement Supplement, to update all that information, it would impose -- if we were trying to do it -- impose on us quite a burden to endeavor to do that. We just have never done that, and it would call for a great many assumptions on our part.

Q So you have to rely on the Applicants' conclusion that such an update would be speculative?

BY WITNESS LEECH:

A Yes, we accept that.

Q Since you haven't been able to do a cost/benefit analysis update, what is the basis for the last sentence on Page 9-14, the conclusion that, "Any delay would result in reduced benefits"?

BY WITNESS LEECH:

A This pertains to the fact that the sooner we get on with the project to try to achieve its intended purpose of gathering information of various kinds, the

1-9 1 more productive it is. So if you delay the process,
2 obviously you are not accomplishing that goal so quickly.

3 Q So it's based on the assumption that the
4 information is needed soon?

5 BY WITNESS LEECH:

6 A Well, yes.

7 I should point out, however, that as far as
8 we are concerned, we have to keep in mind that the timing
9 and the need for the project are taken as a given by the
10 Commission's Order of 1976.

11 Q I'd like to direct your attention to
12 Section 9.2.6.4, which the Final Supplement states has no
13 change relative to the old FES. So you'll have to look
14 in the old FES, and specifically, I'm looking at Page 9-22.

15 In the first long paragraph about six lines
16 from the bottom, the sentence states, "A measure of the
17 relative differences was obtained by estimating the
18 relative consequences in terms of over-all population
19 exposures out to 50 miles. The radiological doses at the
20 alternative ERDA sites would be roughly a factor of 10
21 less than at the Clinch River site by this measure."

22 Is this statement still correct, to the best
23 of your knowledge?

24 BY WITNESS LEECH:

25 A I'd like to defer the answer of that question

11-10 1 to Dr. Soffer.

2 Q Fine.

3 BY WITNESS SOFFER:

4 A We have not done any revised analyses in this
5 regard, but we believe that the statement still is
6 reasonable.

7 Q Were you present this morning when we
8 discussed the factor of 50 difference cited by the
9 Applicants?

10 BY WITNESS SOFFER:

11 A Yes, I was.

12 Q Was that the same parameter?

13 BY WITNESS SOFFER:

14 A No, I do not believe it is.

15 Q Could you explain the difference, please?

16 BY WITNESS SOFFER:

17 A The factor of 50, I believe, which is also
18 addressed in the first paragraph, just several lines up,
19 says that -- and I'm reading from the old FES, Section
20 9.2.6.4. It states: "Assuming that the demonstration
21 reactor could be located on the alternative ERDA sites
22 at a distance of approximately 8,000 meters from the
23 nearest residence, the radiological doses at that
24 residence would be roughly 50 times lower at the
25 alternative ERDA sites than at the Clinch River site,

1 based on the Staff's conservative dispersion conditions
2 assumed for the dose calculations in the Staff's safety
3 Review."

4 Consequently, the factor of 50 as a comparison
5 of doses to a hypothetical individual at the site boundary,
6 the factor of 10 difference is a measure of the relative
7 differences in the collective population dose out to
8 relatively large distances.

9 Q Is it your understanding that the Applicants
10 in this regard were referring to the consequences to the
11 maximally exposed individual?

12 BY WITNESS SOFFER:

13 A I did not get a clear understanding of what
14 they were referring to.

15 Q The conclusion of Section 9.2, that is,
16 Section 9.2.7, the first sentence of that -- of the
17 Supplement, yes -- the first sentence of that has been
18 changed in the Final Supplement relative to the old FES.

19 It states now that, "The Staff concluded that
20 the DOE sites are not substantially better than the
21 Clinch River sites; whereas, in the 1977 FES, the
22 conclusion, once again on Page 9-22, was that, "Those
23 sites have sufficient advantages over the proposed
24 demonstration plant site to warrant detailed consideration.
25 Those sites are better than the proposed site or any of

1-12 1 the other alternative sites because the isolation provided
2 wou'd result in lower radiation doses in the event of
3 an accidental release of radioactivity in terms of both
4 the nearest receptor and the total number of people
5 exposed."

6 Is this change intended to be substantive or
7 is it merely semantic?

8 Have you assessed the preferability
9 differently since 1977 or have you just changed from
10 "they are better" to "they are not substantially better"?

11 BY WITNESS SOFFER:

12 A. I think there has been a reassessment of the
13 preferability since 1977, yes.

14 Q. And what changes led to that reassessment?

15 BY WITNESS SOFFER:

16 A. The 1976 FES made some judgments based on
17 consideration of design basis accidents and the differences
18 of design basis accidents.

19 Since that time there has been an assessment
20 of accidents beyond the design basis, which the Staff has
21 reported in Appendix J of the FES Supplement, and that
22 appendix has demonstrated that the risks of accidents
23 beyond the design basis are very large.

24 There has also been a reassessment of the
25 design basis accidents to a hypothetical individual, as

1 reported in the site suitability report in NUREG-0786,
 2 and that assessment shows that the consequences from the
 3 design basis accidents are very low at the Clinch River
 4 site.

5 The combination of those factors has, I would
 6 say, altered the Staff's position somewhat, and it judges
 7 that there is no significant differences between the
 8 Clinch River site and the alternative sites.

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1 BY MR. TOUSLEY:

2 Q Have there been any significant changes in
3 the population and meteorology considerations between 1977
4 and 1982 for those DOE sites, vis-a-vis, CRBR?

5 BY WITNESS SPICKLER:

6 A Why don't I answer the second part of the
7 question meteorology --

8 Q Fine.

9 BY WITNESS SPICKLER:

10 A With regard to meteorology, the CRBR site
11 was re-evaluated using a differing model, as we pointed
12 out in response to interrogatories, than was previously
13 used back in 1976.

14 The alternate sites also were analyzed reflect-
15 ing this newer model since then.

16 Q Is that true of all of the alternate TVA
17 sites, as well as the DOE sites?

18 BY WITNESS SPICKLER:

19 A Let me think for a moment.

20 The data that appears on Page 14 does reflect
21 differing -- the newer model, yes.

22 MR. MIZUNO: Mr. Spickler, Page 14 of your
23 testimony?

24 WITNESS SPICKLER: Of my testimony, yes.
25 /

12-2

1 BY MR. TOUSLEY:

2 Q For all the TVA alternative sites?

3 BY WITNESS SPICKLER:

4 A Yes.

5 Q What difference in results did the change
6 in model cause between 1977 and 1982?

7 BY WITNESS SPICKLER:

8 A For the alternative sites I don't know. For
9 the CRBR site, if you recall, at the site boundary there
10 was a difference of a factor of two in the two-hour
11 X/Q value. It was about a factor of two lesser now as
12 compared to the value that was presented in the 1977
13 site suitability report.

14 Q That's the two-hour at the exclusionary
15 boundary?

16 BY WITNESS SPICKLER:

17 A That's correct.

18 Q There was no difference in the meteorology
19 data; is that correct -- between '77 and '80?

20 BY WITNESS SPICKLER:

21 A There was difference in data. There was a
22 different data set, but the primary difference in the
23 results was the differing model.

24 Q Is there any uncertainty in these X/Q values
25 that are being used in the updated models?

1 BY WITNESS SPICKLER:

2 A. I have no uncertainty with regard to the data
3 base. And that's exactly why we used the data base that
4 we did for the updated review in 1972.

5 In the earlier review, I felt that there were
6 some questions with regard to either the measurements meet-
7 ing Regulatory Guide 1.23 requirements, recovery of
8 data or exposure of equipment or replacement of data from
9 one level to another level.

10 The data set that was used for the 1982
11 analysis, I have no doubts about the -- whether the data
12 is quality data and whether it meets all of Regulatory
13 Guide 1.23 requirements.

14 That was the reason that this data set was
15 used.

16 Q Are there any uncertainties associated with
17 the use of models?

18 BY WITNESS SPICKLER:

19 A. All of the models are prescribed, and model
20 uncertainties, I don't really know what -- how you can
21 approach that subject. I can tell you that in applica-
22 tion of the diffusion data that was used to develop the
23 Regulatory Guide that those calculations are based upon,
24 that there were conservatisms taken with regard to the
25 evaluation of the data, so that if there are errors in

12-4

1 the analysis and the development of the models, they would
2 be in the conservative direction anyway. And in all
3 likelihood, the uncertainties would be in a non-
4 conservative direction; therefore, probably reducing the
5 potential doses that would result.

6 In applying these models, we made an overt
7 attempt to go in the conservative direction.

8 Q Dr. Soffer -- Is that correct?

9 BY WITNESS SOFFER:

10 A It's "Mr. Soffer."

11 Q Mr. Soffer. Someone threw me a loop there.

12 Were there any changes in the population data
13 that were used between 1977 and 1982?

14 BY WITNESS SOFFER:

15 A We updated the population data for the
16 Clinch River site using 1980 census data. We made efforts
17 to project the alternative site data up to 1980 and
18 perhaps Mr. Ferrell can discuss that in more detail, if
19 you wish.

20 Q Were these changes in the data or models
21 used to calculate the population and meteorological factors
22 here a significant factor in your change in conclusion
23 about the preferability of the DOE sites, vis-a-vis, CRBR?

24 BY WITNESS SOFFER:

25 A I can't speak with regard to the meteorology.

12-5

1 I will have to defer to Mr. Spickler.

2 But the changes in population, in my opinion,
3 were quite minor. It did not affect the nature of our
4 re-evaluation.

5 What chiefly affected our re-evaluation was
6 a better assessment of accidents beyond the design basis,
7 as given in Appendix J of the FES, and a revised assess-
8 ment of the design basis accidents as given in the re-
9 vised site suitability report.

10 Q So would it be correct to say that the major
11 reason for the changed conclusion is the results of
12 Appendix J?

13 BY WITNESS SOFFER:

14 A The results of Appendix J, together with the
15 results of the revised site suitability report.

16 Q Mr. Leech, in Section 9.2 of the Supplement,
17 you state that 109 TVA sites were initially identified;
18 is that correct -- by the Applicants?

19 MR. MIZUNO: Can you identify the specific
20 section? Nine point two point?

21 MR. TOUSLEY: Page 9-2, Section 9.2.4.1.

22 WITNESS LEECH: Yes. Evidently the Appli-
23 cants identified 109 potential sites for an entirely new
24 plant.

25 /

1 BY MR. TOUSLEY:

2 Q Did the Staff have any figures to show the
3 population density of those 109 sites?

4 BY WITNESS LEECH:

5 A No. The Staff did not examine 109 sites
6 or consider 109 sites.

7 Q Did you make any attempt to determine whether
8 any of those 109 other sites would be substantially better
9 than the Clinch River site?

10 BY WITNESS LEECH:

11 A Some of the 109 -- well, actually all the
12 candidate sites presumably came from the 109 -- or
13 virtually all of them.

14 We considered all of those.

15 Q And you did not consider the ones that
16 weren't the candidate sites; is that correct?

17 BY WITNESS LEECH:

18 A Basically that is correct.

19 Q Am I correct that population and meteorology
20 were considered independently in your alternative siting
21 analysis?

22 BY WITNESS SOFFER:

23 A They were considered independently in the
24 alternative analysis, as represented in the FES. We
25 have, however, very recently examined the effect of

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wind direction and population together to see whether it would change any of our conclusions in this regard.

Q You say wind direction and population?

BY WITNESS SOFFER:

A Yes.

Q Did you -- You did not also include the factor of atmospheric dispersion?

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bm

1 BY WITNESS SOFFER:

2 A No, I did not.

3 Q That doesn't appear anywhere in your testi-
4 mony or in the --

5 BY WITNESS SOFFER:

6 A No, it is not. It is a very recent analysis
7 that was performed.

8 Q Do you believe it would be appropriate to
9 have considered population and meteorology together in
10 your analysis in the FES?

11 MR. MIZUNO: I believe that's going beyond
12 the bounds of the Commission's regulations. The Commis-
13 sion's regulations do not require -- or at least I do not
14 know of any Commission regulation requiring a simul-
15 taneous consideration of population density --

16 MR. TOUSLEY: I'm not asking about a require-
17 ment. I'm asking if he believes it would be appropriate
18 to consider them.

19 MR. MIZUNO: That would be a challenge to
20 the Commission's regulations.

21 JUDGE MILLER: Well, is there anything in the
22 regulations that prohibits it?

23 It's just not covered, is it?

24 MR. MIZUNO: I believe that the Commission has
25 set forth its regulations regarding population density --

12-9

1 or I should say demographic criteria.

2 Since they did not address the question of
3 joint consideration of population density and meteorology,
4 but they did consider meteorology separately as a com-
5 ponent of the dose calculations, that it would be the
6 Staff's position that by not talking about it, they pre-
7 cluded it.

8 And to inject an additional consideration would
9 be to, in essence, challenge the adequacy of the Commis-
10 sion's regulations.

11 JUDGE MILLER: Well, the Board doesn't see it
12 as a challenge to the regulations. But I think he's
13 inquiring as to the appropriateness, which the witness,
14 if he has an opinion, is free to express; and he may not
15 have. I don't know.

16 You may answer.

17 WITNESS SOFFER: Could you put the question
18 again?

19 MR. TOUSLEY: Yes, certainly.

20 BY MR. TOUSLEY:

21 Q Do you believe that it would be more ap-
22 propriate for the Staff to have considered population and
23 meteorology jointly in their consideration of the alter-
24 natives sites?
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BY WITNESS SOFFER:

A I think there may be certain hypothetical conditions where it may be appropriate to consider meteorology and population together. I will ask Mr. Spickler to join me on this, if he is able to.

But it's my experience -- and it has been the experience of the Staff -- that generally the two disciplines have been sufficiently separated, that the Staff's experience has been that the combination of the two disciplines together does not materially alter the conclusions on siting, when they are considered separately.

BY WITNESS SPICKLER:

A That's also my conclusion.

Q Would it be correct to state that the significance of population density to the alternative siting analysis is in its contribution to the comparison of radiological risks at various sites?

BY WITNESS SOFFER:

A Population has been used as a surrogate for the residual risk associated with accidental releases, that is correct.

Q And how do you feel about the quality of population as a surrogate for risk?

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12-11

1 BY WITNESS SOFFER:

2 A I don't understand what you mean by the
3 word "quality."

4 Q Is it a good surrogate? Or is it a very
5 crude surrogate? Or is it a --

6 BY WITNESS SOFFER:

7 A I would regard it as a rather crude surro-
8 gate.

9 Q Is the significance of meteorology at various
10 sites also to its contribution to the assessment of
11 radiological risks?

12 BY WITNESS SOFFER:

13 A I don't know the answer to that.

14 Q Well, can you tell me what the significance
15 of meteorology is?

16 Mr. Spickler, perhaps, would be better to
17 answer this.

18 BY WITNESS SPICKLER:

19 A When we look at the differences between
20 sites when we're talking about risk, I don't think, frankly,
21 that the meteorology -- the meteorological differences
22 between sites are such that you significantly change
23 potential risks as described at Appendix J of our FES.

24 There are differences, but they don't signi-
25 ficantly change the probabilistic numbers that are stated

12-12

1 in the FES.

2 Studies of this kind have been conducted by
3 Sandia, in looking at the base for this consequence
4 analysis; and that's the conclusion that they've reached.

5 I've read the documents prepared by Sandia,
6 and they're probably correct.

7 Q Why do you consider meteorology as part of
8 your alternative siting analysis?

9 BY WITNESS SPICKLER:

10 A Just as a relative factor as we consider
11 other factors. I didn't say it was a factor. I said it
12 didn't significantly change the probabilistic risk assess-
13 ment that's described in Appendix J.

14 Q Would the combination of meteorological con-
15 siderations with population considerations be a less
16 crude surrogate for risk?

17 BY WITNESS SPICKLER:'

18 A It probably would be a little less crude.

19 BY WITNESS SOFFER:

20 A In the particular case of Clinch River, let
21 me describe the analysis that I did to try to examine
22 the simultaneous consideration of prevailing wind
23 directions and population.

24 I performed an analysis that's called a --

25 Q Excuse me. I'm not sure this is responsive

12-13

1 to my question.

2 JUDGE MILLER: Well, what is your question?

3 MR. TOUSLEY: I simply asked if it -- the
4 combination of meteorology and population yielded a less
5 crude surrogate for risk.

6 MR. EDGAR: Well, this gentleman was trying
7 to address the combination now and explain whether it's
8 crude or not crude.

9 I hope -- It seems to me straightforward.

10 MR. TOUSLEY: I believe I got my answer.

11 JUDGE MILLER: What was the answer you got?

12 WITNESS SPICKLER: A little less crude.

13 JUDGE MILLER: I heard that one. Now why
14 were you objecting to Mr. Soffer's testimony? Why were
15 you disclaiming it, I guess is what you were really doing,
16 wasn't it?

17 What were you doing?

18 We'll recess for lunch. 12:00 to 1:00.

19 (Whereupon, at 12:00 noon the hearing was
20 recessed, to reconvene at 1:00 p.m. of the same day.)
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AFTERNOON SESSION

1:00 p.m.

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3 JUDGE MILLER: Are we ready to resume the
4 hearing?

5 Let the record show that upon the request
6 from Staff Counsel and there being no objection from
7 Counsel representing the other parties, that the
8 witness, Mr. Lowenberg, who has another business
9 appointment at this time has been excused.

10 (Witness Lowenberg excused.)

11 JUDGE MILLER: You may proceed with your
12 cross-examination.

13 BY MR. TOUSLEY:

14 Q Mr. Spickler, I would like to direct your
15 attention to your table on Page 14 of your testimony,
16 please?

17 BY WITNESS SPICKLER:

18 A. Fourteen?

19 Q. Yes.

20 BY WITNESS SPICKLER:

21 A. Yes.

22 Q. Would you agree that the accident X/Q values
23 which you show here for the Hartsville site average about
24 a factor of two lower than those for the Clinch River
25 site?

3-2
1 BY WITNESS SPICKLER:

2 A. Yes.

3 Q And would you agree that the same values for
4 the Yellow Creek site, although they vary a lot more,
5 average between a factor of about six and a factor of
6 about two better than the Clinch River site?

7 BY WITNESS SPICKLER:

8 A. No, I would not agree, because the two-hour
9 X/Q value for Yellow Creek is less than a factor of two
10 worse.

11 The Yellow Creek site is 1.5×10^{-3} for
12 zero to two hours, versus 1.2×10^{-2} for Clinch River.

13 JUDGE HAND: But it's not zero to two hours,
14 is it?

15 WITNESS SPICKLER: The zero to two X/Q value
16 is what I'm talking about, the third column in that
17 table.

18 BY MR. TOUSLEY:

19 Q So this should not be 0.2 --

20 JUDGE HAND: It's labeled "0.2 hours."

21 WITNESS SPICKLER: It should be "0 to 2," I'm
22 sorry. It's a typo that I missed. "0 - 2."

23 BY MR. TOUSLEY:

24 Q Does the zero to two-hour value for the
25 exclusionary boundary affect as many people as the values

3-3 1 for the limited population zone outer boundary?

2 BY WITNESS SPICKLER:

3 A Potentially no. Just pointing out a response
4 to your question. You asked me if all the values were a
5 factor of two less conservative, and I was pointing out to
6 you that the zero to two-hour is indeed more conservative
7 than is the CRBR two hour.

8 Q Which of these X/Q values has the greatest
9 effect on population consequences?

10 MR. MIZUNO: Excuse me, "population
11 consequences"?

12 MR. TOUSLEY: Dose consequences to the
13 population.

14 WITNESS SPICKLER: Well, you are talking
15 hypothetical calculations. If you are talking
16 hypothetically based on these hypothetical calculations
17 which has the potential for affecting more people, it's
18 the zero to thirty-day X/Q values.

19 These are prescribed calculations.

20 If you recall, in the section that discusses
21 the alternate sites, we did say that the Hartsville and
22 Yellow Creek sites have slightly better meteorological
23 diffusion capabilities, but we felt that they were
24 still comparable.

25 /

3-4

1 BY MR. TOUSLEY:

2 Q Okay. These kinds of differences --

3 BY WITNESS SPICKLER:

4 A Yes, I felt that they are comparable.

5 Q -- are comparable?

6 BY WITNESS SPICKLER:

7 A Yes.

8 Q Okay. Would the value for the four to thirty-
9 day contribution be the most important in terms of doses
10 to the public?

11 BY WITNESS SPICKLER:

12 A I don't know.

13 Q Mr. Ferrell, on Page 20 you report that the
14 zero to thirty-mile population density projection for
15 the year 1990 at CRBR is 197 persons per square mile;
16 is that correct?

17 BY WITNESS FERRELL:

18 A Yes, sir.

19 Q And on Page 22 you report the same population
20 density parameter for the alternative sites; is that
21 correct?

22 BY WITNESS FERRELL:

23 A Yes, sir.

24 Q Would you agree that the population value
25 for the Yellow Creek site is about a factor of four lower

13-5 1 than for the Clinch River site?

2 BY WITNESS FERRELL:

3 A Yes, sir, I would agree to that.

4 Q And the Hartsville site is about a factor of
5 three lower?

6 BY WITNESS FERRELL:

7 A Yes, sir, just about.

8 Q I'm not sure which one of you to direct these
9 to, so I'll ask the question first and then you can
10 determine it.

11 Taking into account these differences in both
12 population and meteorology, for the Yellow Creek site,
13 for instance, if we take the population density as
14 about 25 percent of that of Clinch River, and, for example,
15 the four to thirty-day X/Q value as about 17 percent of
16 that at Clinch River, do you agree that multiplying those
17 together, the relative radiological risk would be about
18 four percent of that at Clinch River?

19 BY WITNESS SOFFER:

20 A I don't believe we have performed that
21 analysis, so I can't answer that question.

22 Q Well, if 24 percent times 17 percent is in
23 fact about 4 percent, would that be a correct conclusion?

24 BY WITNESS SOFFER:

25 A I don't doubt your multiplication, but I'm

3-6
1 not sure whether those factors would enter into the
2 analysis of relative risks or not, and we haven't done it
3 for the alternative sites.

4 Q So you don't know the answer to the question,
5 then?

6 BY WITNESS SOFFER:

7 A That's correct.

8 Q Mr. Leech, in doing the over-all analysis on
9 alternative sites, how do you combine the individual
10 factors into an over-all preferability?

11 BY WITNESS LEECH:

12 A To judge preferability of an alternate site to
13 another site, we have in each of the parameters that we
14 describe in Appendix L made a judgment by the particular --
15 by each of the specialists in those parameter areas,
16 and then we examine together as a team and reach a
17 consensus whatever the differences may be.

18 Q Are the various factors weighted in any
19 particular way?

20 BY WITNESS LEECH:

21 A No.

22 Q Are they given equal weight?

23 BY WITNESS LEECH:

24 A No.

25 Q Mr. Leech, is it your opinion that any further

3-7
1 reduction in the risk associated with the Clinch River
2 Breeder Reactor would be insignificant?

3 BY WITNESS LEECH:

4 A. Yes.

5 JUDGE LINENBERGER: Excuse me, Mr. Tousley.
6 Mr. Leech, you gave two successive "no"
7 answers earlier. To the first question, "Were weighting
8 factors assigned," you said, "No," and then I thought the
9 next question was, "Were these various parameters given
10 equal weight," and I thought you again answered, "No."

11 If my recollection is right about the
12 questions and the answers, then I'm confused by those
13 two "no" answers.

14 Can you comment a little further, please?

15 Maybe my recollection is wrong, so....

16 WITNESS LEECH: If I remind myself a bit here
17 for a minute, the first one asked me if we assigned
18 weighting factors to parameters.

19 JUDGE LINENBERGER: Right.

20 WITNESS LEECH: And I said, "No."

21 The second one, did we --

22 JUDGE MILLER: Were they given equal weight.

23 JUDGE LINENBERGER: And I think you again
24 said, "No."

25 WITNESS LEECH: Correct. I think what I

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would have to say is that the amount of weight we give to one parameter versus another relative to any particular site and site comparison varies according to what we feel among our team members and among us as a whole is the importance of the particular parameter for a particular site.

It varies from one site to another.

- - -

3-9 1 JUDGE MILLER: Kind of a floating weight, then?

2 WITNESS LEECH: It is. It is kind of a
3 judgment.

4 JUDGE LINENBERGER: So it is not that they
5 are unweighted, but there's not a constant weight factor
6 amongst the team effort with respect to any given
7 parameter?

8 WITNESS LEECH: That's correct.

9 JUDGE LINENBERGER: Thank you.

10 BY MR. TOUSLEY:

11 Q Mr. Spickler, would you say that the
12 atmospheric diffusion conditions at the five TVA sites
13 considered are very similar?

14 BY WITNESS SPICKLER:

15 A They are similar, yes.

16 Q Very similar?

17 BY WITNESS SPICKLER:

18 A Very similar, yes.

19 Q Mr. Leech, how were the estimates of
20 potential construction labor force made?

21 BY WITNESS LEECH:

22 A Construction labor force numbers were
23 available for 1970, as I recall. Those were the Census
24 numbers used. The 1970 construction labor pool, call it, in
25 an area were available from the Census. As I recall,

3-10
1 the way it was done was -- I have to tell you I can't
2 remember whether the 1980 Census was then used to update
3 those numbers as we went through our shifting from one to
4 another.

5 I'm not sure whether they were available or
6 not.

7 Q Does anyone else know about that?

8 BY WITNESS LEECH:

9 A I think the only way in which we might know
10 about that would be to ask Mr. Ferrell if he knows.

11 BY WITNESS FERRELL:

12 A I don't know.

13 BY WITNESS LEECH:

14 A In any event, a socioeconomic reviewer, in
15 looking at the labor force pool numbers from the Census
16 then converted that to the year 1985 or '6 (I believe it
17 was '85), because would be approximately the time period
18 of delay between 1982 and 1985.

19 So he was looking for labor supply numbers for
20 each of these site areas at that date. He arrived at
21 those within a 50-mile radius from each site.

22 Q And you are not sure whether those projections
23 were based on the '70 or '80 Census?

24 BY WITNESS LEECH:

25 A I don't recall that.

3-11 1 Q If they were based on the '70 Census data, is
2 it possible that those would have any substantial
3 inaccuracies in them?

4 BY WITNESS LEECH:

5 A No, I don't think so.

6 Q What would you say is the margin of error for
7 these labor force estimates?

8 BY WITNESS LEECH:

9 A By the Census Bureau?

10 Q That you did in your analysis?

11 BY WITNESS LEECH:

12 A I don't know.

13 Q Does anyone know?

14 (No response.)

15 Q In the discussion of socioeconomic effects
16 for the Phipps Bend site at Page L-24, you site a labor
17 force difference between Phipps Bend and Clinch River
18 which amounts to about 13 percent of the Clinch River
19 force size.

20 Do you consider that kind of difference
21 significant?

22 BY WITNESS LEECH:

23 A Yes.

24 Q Did your conclusion take into account the
25 cancellation of the Phipps Bend Units 1 and 2, and the

3-12 1 effects that would have on the availability of labor in
2 the area?

3 BY WITNESS LEECH:

4 A Well, we took that into consideration, but it
5 doesn't have any effect.

6 Q When did work stop on the canceled Phipps
7 Bend units; do you know?

8 BY WITNESS LEECH:

9 A I believe they were already on postponement
10 when we visited there a year ago, and I think that
11 probably had happened only recently at that time.

12 There was a very small force of people there,
13 I guess probably doing maintenance and that sort of thing.

14 Q About a year ago?

15 BY WITNESS LEECH:

16 A Uh-huh.

17 Q Going back to you, Mr. Spickler, for a minute.

18 On Page 15 of your testimony you state that,
19 "The Savannah River site shows significantly better
20 diffusion characteristics -- conditions."

21 What is the meaning of "significantly better"
22 in this context?

23 BY WITNESS SPICKLER:

24 A Well, our assessment of the X/Q values for the
25 Savannah River site was that the diffusion conditions were

3-13
1 better by a margin that we felt justified our saying that
2 it was a significantly better meteorological site than
3 the TVA sites were.

4 Q I believe -- Would you agree that the X/Q
5 values that you have identified for the Savannah River
6 site average around -- well, I'm sorry -- the limited
7 population zone values, anyway, average around 23 or 24
8 percent of those at Clinch River?

9 BY WITNESS SPICKLER:

10 A The significant one, I felt -- I realize that
11 there isn't that big a difference in the 30-day, but the
12 two-hour is an order of magnitude, almost, better, close
13 to an order of magnitude better.

14 Q Okay. And you feel the two-hour one is
15 the most significant?

16 BY WITNESS SPICKLER:

17 A It's a very important one, yes.

18 Q And why is that?

19 BY WITNESS SPICKLER:

20 A In general siting considerations, the
21 two-hour dose is generally the most limiting dose. The
22 two-hour dose at the exclusion zone boundary is generally
23 the most limiting of the doses.

24 Q And that takes into consideration the fact
25 that there would be much more limited population exposed

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at that point?

BY WITNESS SPICKLER:

A. No. It's a matter of the calculational technique. In generalities, in most cases the most limiting case relative to Part 100 considerations is meeting the Part 100 considerations for the two-hour dose at the exclusion zone boundary, in most cases.

Q. Is that true at the Clinch River site?

BY WITNESS SPICKLER:

A. As I recall, in the site suitability report, that was true, also, that the site boundary doses are more limiting than are the low population zone doses.

JUDGE LINENBERGER: Mr. Spickler, with respect to the answer you just gave to Counsel's last question, are there any considerations within there that involve how planned emergency response activities might go?

Does that enter into the considerations that resulted in your answer, or is that completely separate?

WITNESS SPICKLER: That would be separate.

JUDGE LINENBERGER: Thank you.

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14-1

1 BY MR. TOUSLEY:

2 Q Can you explain to me what you mean when you
3 use the expression, "the more limiting factors"?

4 BY WITNESS SPICKLER:

5 A Well, it's the dose that's closer to the
6 Part 100 doses.

7 The calculated dose that's closest, generally,
8 to the Part 100 allowable dose.

9 Q In terms of percentage?

10 BY WITNESS SPICKLER:

11 A Right. Percent of allowable.

12 In most cases that's the case and, as I see
13 from our site suitability report, that was also the case.

14 Q Can you tell us what X/Q values you're using
15 for the LPZ and for the two-hour dose at Clinch River
16 when you draw those conclusions?

17 BY WITNESS SPICKLER:

18 A The ones that are in that table.

19 Q The table on Page 14?

20 BY WITNESS SPICKLER:

21 A I believe that's correct. Let me check to
22 make sure. Yes. That's correct.

23 By the way, that last number should be 1. --
24 that's correct. That's exactly the same number.

25 Q These numbers on Page 14 are the same as

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14-2
1 those in the site suitability report?

2 BY WITNESS SPICKLER:

3 A Correct.

4 Q Mr. Soffer, is your conclusion on Page 22,
5 Answer 45, that none of the alternative sites are
6 preferable to the Clinch River site on the basis of
7 population; is that conclusion based solely on the fact
8 that the Staff does not attach any significance to the
9 actual differences which appear here?

10 BY WITNESS SOFFER:

11 A No. It was based upon consideration of
12 additional factors that appear in our analysis. Those
13 additional factors are the results of Appendix J, which
14 shows the risks of severe accidents are very low and the
15 results of the site suitability report, which show that
16 the doses associated with the hypothetical design basis
17 accidents are within the guideline doses of Part 100.

18 As well as the fact that the population for
19 the Clinch River site and each of the alternative sites,
20 is well below the values given in Regulatory Guide 4.7.

21 Q Okay.

22 Do you agree with Mr. Leech's conclusion just
23 a while ago, that any reduction in the risk would not be
24 significant?

25

1 BY WITNESS SOFFER:

2 A For the case of Clinch River, yes.

3 Q In your opinion, would a site with no
4 resident population within ten miles not be preferable to
5 the Clinch River site?

6 BY WITNESS SOFFER:

7 A In my opinion, the risks associated with such
8 a site would be numerically smaller than are shown in
9 Appendix J but the results that are given in Appendix J
10 are already at such a very low level that I do not believe
11 that it would be significant, there would be a significant
12 reduction in risk.

13 Q So your conclusion is, that the site would not
14 be preferable?

15 BY WITNESS SOFFER:

16 A That is correct.

17 Q If the results of Appendix J were a factor of
18 500 higher than they now appear, would your conclusion
19 be the same?

20 BY WITNESS SOFFER:

21 A I can't say. I haven't gone through that
22 analysis and looked at it. I haven't looked at the results
23 of other analyses. I haven't performed that degree of
24 analysis in my own mind.

25 What I have looked at is variations.

1 I have asked myself the question, whether I
2 would change my conclusion if the results were a factor of,
3 say, ten or so lower and my conclusion is no and a factor
4 of several times higher, and my conclusion is also no.

5 But I have not really considered whether I
6 would change my conclusion whether it was a factor of
7 500 times.

8 Q If the doses were a factor of 50 higher, would
9 the site be able to be found suitable under Part 100?

10 BY WITNESS SOFFER:

11 A Which doses are you speaking of?

12 Q The Clinch River doses.

13 BY WITNESS SOFFER:

14 A You mean the site suitability doses?

15 Q Yes.

16 BY WITNESS SOFFER:

17 A If it was a factor of 50 higher, the doses
18 presumably would be above the guidelines of Part 100.

19 But it is not necessarily the case that the
20 site would be found unsuitable because the test of
21 site suitability is not merely the site alone, but the
22 site in combination with the plant engineered safety
23 features.

24 It is possible that the engineered safety
25 features could be revised or modified in a suitable

1 fashion to bring the doses into conformity, the doses of
2 Part 100.

3 Q On Page 23, about two-thirds of the way down
4 the page, you state that:

5 " -- Reg. Guide 4.7 specifies
6 that areas with low population
7 densities are to be preferred
8 in the siting of nuclear
9 reactors."

10 Does the Reg. Guide state that this principle
11 only applies when population densities are over 500 per
12 square miles, up to thirty miles, at the time of plant
13 start up?

14 BY WITNESS SOFFER:

15 A The Regulatory Guide provides a prescription
16 of what to do when a proposed site exceeds 500 people per
17 square mile. That is, it places an extra burden upon
18 the Staff and the Applicant to show that such a proposed
19 site, which exceeds the trip levels of Reg. Guide 4.7
20 should be preferred over lower population density sites.

21 The Regulatory Guide is silent about what to
22 do when a proposed guide is below the trip levels and,
23 consequently, the Staff practice has been that such sites
24 need not be given any consideration in weighting, when
25 it comes to population considerations.

14-6

1 MR. MIZUNO: Excuse me, Mr. Soffer.

2 You said guide below the trip levels. You
3 meant site below the trip levels?

4 WITNESS SOFFER: Yes. I meant site below
5 the trip levels. I'm sorry.

6 BY MR. TOUSLEY:

7 Q If a site with a low population density is to
8 be preferred, as Reg. Guide 4.7 states, why wouldn't a
9 site which has zero persons per square mile up to thirty
10 miles, be far preferable to a site with 500 persons per
11 square mile?

12 BY WITNESS SOFFER:

13 A Because it's possible that the risk attained
14 by a low population density site can already be at such
15 a low level, that any further reduction in risk or
16 requiring any further reduction in risk is not necessary,
17 in my opinion.

18 Q Also, on Page 23, you state that:

19 "Reg. Guide 4.7 defines low
20 population densities to be
21 those which are below the trip
22 levels."

23 Can you tell me, please, where the Reg. Guide
24 defines low population densities?

25

1 BY WITNESS SOFFER:

14-7 2 A The Staff has interpreted that as a definition
3 since the Reg. Guide wording indicates, in the first
4 sentence, that areas of low population density are
5 preferred and then goes on to state what the trip levels
6 should be.

7 Consequently, the Staff has defined those
8 values, values below the trip levels, to be low population
9 density levels.

10 Q So that the Reg. Guide itself does not
11 actually define that term; is that correct?

12 BY WITNESS SOFFER:

13 A I would not agree with that statement. I think
14 that there is an implicit definition in the Regulatory
15 Guide.

16 Q Does the Reg. Guide state that there should be
17 no distinction between sites with differing population
18 densities below the trip levels?

19 BY WITNESS SOFFER:

20 A The Reg. Guide does not specifically state
21 that, no.

22 Q Does it either state or imply the differences
23 in population densities below the trip levels are
24 insignificant?
25

1 BY WITNESS SOFFER:

2 A I believe that there is an implication of
3 that nature because there is no requisite showing by either
4 the Staff or Applicant that alternative sites below that
5 trip level -- that any further analysis need be done.

6 Q I'd like to direct your attention to the Reg.
7 Guide. Can you get a copy of that in front of you?

8 BY WITNESS SOFFER:

9 A I don't have a copy with me.

10 MR. TOUSLEY: Does the Staff have a copy they
11 can provide? Or I'll share mine, if I need to.

12 WITNESS SOFFER: I have a copy of the Reg.
13 Guide with me.

14 BY MR. TOUSLEY:

15 Q Okay.

16 I'd like to direct your attention to Page
17 4.7-9.

18 BY WITNESS SOFFER:

19 A I have it in front of me.

20 Q Paragraph 3 says -- entitled Population
21 Considerations.

22 BY WITNESS SOFFER:

23 A Yes.

24 Q The last sentence in that first paragraph, under
25 Population Considerations states:

14-9

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1 "If the population density of
2 proposed site is not
3 acceptably low, then Applicant
4 will be required to give special
5 attention to alternative sites
6 with lower population density."

7 Is that correct?

8 BY WITNESS SOFFER:

9 A Yes.

10 Q The next paragraph provides the trip levels.

11 BY WITNESS SOFFER:

12 A That is correct.

13 Q 500 per square mile at plant start up and 1000
14 per square mile at shut down, and it concludes that:

15 "If those trip levels are exceeded,
16 special attention should be given
17 to the consideration of alternatives
18 with lower population densities."

19 BY WITNESS SOFFER:

20 A That's correct.

21 Q Doesn't this suggest that the population
22 densities above the trip levels are not acceptably low?

23 BY WITNESS SOFFER:

24 A No, not at all.

25 The Staff has reiterated time and time again

14-10 1 that the trip levels represented in Reg. Guide 4.7 are
2 not upper bound limits of acceptability. They are merely
3 trigger levels which -- where an additional level of review an
4 an additional burden is placed upon Staff and Applicant
5 for a showing of alternative sites and that this is not
6 an upper bound acceptability criteria.

7 Q Would you agree that the first sentence that
8 I read, the last sentence in the first paragraph, that is,
9 says:

10 "If the population density is
11 not acceptably low, special
12 consideration is to be
13 considered to alternatives."

14 BY WITNESS SOFFER:

15 A Yes, that's the sentence in the Reg. Guide.

16 Q And the next sentence says:

17 "If the trip levels are exceeded,
18 special attention needs to be
19 given -- "

20 BY WITNESS SOFFER:

21 A That is correct.

22 Q And that does not suggest to you that
23 population densities which exceed the trip levels are not
24 acceptably low?

25

1 BY WITNESS SOFFER:

11- 2 A They are trip levels but there is no value
3 judgment made about their acceptability.

4 Q I'd like to direct your attention now to the
5 proposed rule on alternative sites in Appendix K.

6 Specifically Page K-9 of Volume 2 of the final
7 supplement.

8 BY WITNESS SOFFER:

9 A I have it in front of me.

10 Q And specifically to Criterion No. 7 under Part
11 6(2)(a) in about the middle of the middle column.

12 BY WITNESS SOFFER:

13 A Yes. I see it.

14 Q Don't the same trip levels of 500 per square
15 mile and 1000 per square mile appear here as acceptance
16 criteria for candidate sites?

17 BY WITNESS SOFFER:

18 A Yes, they do.

19 Q So, in order to be acceptable as candidate
20 sites, the proposed rule suggests that sites with population
21 densities above the thresholds are not acceptably low;
22 does it not?

23 BY WITNESS SOFFER:

24 A As a candidate site.

25 Q Correct.

4-12

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Is there anything in the proposed rule on alternative sites that suggests that sites which meet the threshold criteria, that is, are below the trip levels, need not be compared as to their population densities in the subsequent alternative site analysis?

BY WITNESS SOFFER:

A. Not that I'm aware of.

Q. I direct your attention to the next Page, K-10, Part 7-1 of the proposed rule.

Does the proposed rule, in fact, require the comparison of population as one of the factors that is considered in the first part of the two-part test?

BY WITNESS SOFFER:

A. Yes.

Q. In other words, sites which have already met the trip levels, the same trip levels as are in Reg. Guide 4.7, still need to be compared as to their population; according to this rule. Is that correct?

BY WITNESS SOFFER:

A. Yes.

/

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bm
1 BY MR. TOUSLEY:

2 Q I'd like to direct your attention to the
3 attachment to your testimony, which is entitled "Prioriti-
4 zation of Sites with Regard to Population Density" --

5 BY WITNESS SOFFER:

6 A Yes.

7 Q -- which follows Page 31 of the testimony.
8 Can you briefly explain for purposes of clarifying the
9 record what the purpose of this analysis was when it was
10 done?

11 BY WITNESS SOFFER:

12 A Yes, I'll try.

13 At the time the Commission was considering
14 revising its policy statement on severe accident con-
15 siderations under NEPA, there were some expressions of
16 interest on the part of the Commission as to whether
17 there were high population density sites either in
18 operation or under construction where special probabilistic
19 assessments or other special analyses need be performed.

20 And in such a case the Commission requested
21 that the Staff prepare an analysis of all of the existing
22 sites that were then under active review or where re-
23 actors were presently operating, and, in effect, arrive
24 at a prioritization of which of those sites should be
25 selected for special consideration.

1 This attachment to this appendix was an
2 analysis that I prepared and was submitted as part of that
3 Commission paper.

4 Q Do all of the sites that were included in
5 this analysis meet the standards of 10 CFR Part 100?

6 BY WITNESS SOFFER:

7 A Yes.

8 Q Directing your attention to Page 4 of the
9 attachment where the various groups are described, is it
10 correct that the average class, Group No. 2, includes
11 sites which differ by a factor of four?

12 BY WITNESS SOFFER:

13 A Yes.

14 Q And that the slightly above average class,
15 Class 3, includes sites which are a factor of eight
16 higher than sites in the average class?

17 BY WITNESS SOFFER:

18 A I would say that they are approximately a
19 factor of about three times, because sites in the average
20 class were generally grouped about a value of about 200.
21 And sites in Class 3 were generally grouped at around
22 600.

23 Q Okay. But there were sites in each class
24 that were near the limits; is that correct?

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BY WITNESS SOFFER:

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A That's correct.

Q Considering only radiological risk, would you say that sites in the substantially average average class -- that is, Class 5 -- are preferable to those in the below average category, Class 1?

BY WITNESS SOFFER:

A I haven't examined that. I have not examined the actual radiological risks associated with those sites. I have merely made comparisons on the population and the power level associated with such sites.

Q Considering those factors, would you say that sites in Class 1 were preferable to sites -- I mean sites in Class 5 were preferable to sites in Class 1?

BY WITNESS SOFFER:

A I can't make that judgment because I don't know what the degree of risk associated with these reactors might be.

The answer is: I don't know.

Q In terms -- not worrying about risk, in terms of population, can you answer that question?

BY WITNESS SOFFER:

A There are differences in population between these sites, yes.

Q Some of them are preferable to others?

15-4

1 BY WITNESS SOFFER:

2 A. Some of them are higher than others. Some of
3 them are lower than others. "Preferable" is a value
4 judgment that I cannot make at this time.

5 Q. Is that a value judgment that needs to be
6 made in the alternative siting evaluation?

7 BY WITNESS SOFFER:

8 A. Absolutely.

9 Q. Can you tell me what your expert opinion is
10 about whether any of these sites would be preferable to
11 others, in terms of population?

12 BY WITNESS SOFFER:

13 A. I have already given that conclusion. It
14 appears in the FES Supplement. My conclusion is that
15 from a population point of view, none of the alternative
16 sites are preferable compared to Clinch River.

17 Q. Compared to any other sites?

18 MR. MIZUNO: Objection. I think this line of
19 inquiry has gone on long enough. I think the witness has
20 been asked that question and answered it, by my count,
21 at least three different times.

22 JUDGE MILLER: We think it has been asked
23 and answered.

24 BY MR. TOUSLEY:

25 Q. Can you tell me -- You indicated in your

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1 testimony that the Clinch River site would have fallen
2 into the average class; is that correct?

3 BY WITNESS SOFFER:

4 A Yes.

5 Q Can you tell me about where in that range it
6 would be?

7 BY WITNESS SOFFER:

8 A Yes. I can tell you precisely. The actual
9 numerical value for the Clinch River site -- and I re-
10 computed it this morning -- was 207.

11 I might also add that I do not consider --
12 and we stated so in the analysis -- I stated so in the
13 analysis -- that the differences from one end of the group
14 were so small that we did not consider them to be
15 significant compared to the uncertainties in the overall
16 analysis.

17 Q If -- among the class of all reactor sites
18 which meet the standards of 10 CFR Part 50 and Part 100,
19 would you say there is any basis in that entire range,
20 from the best to the worst site, in terms of population,
21 for saying that one is preferable -- that the best is
22 preferable to the worst?

23 MR. MIZUNO: Objection again. I believe that
24 this is just another restating of the same question. I
25 think the witness has stated --

15-6

1 MR. TOUSLEY: Oh, I believe it was slightly
2 different. I asked about all potential sites meeting
3 the standards of the Commission's regulations.

4 MR. EDGAR: I think he's also trying to get
5 into a question of preferability of a whole bunch of
6 plants that aren't at issue here.

7 The witness has testified clearly as to his
8 judgment on Clinch River versus the alternatives to
9 Clinch River.

10 I'm not aware that some of these sites are
11 alternatives to Clinch River.

12 MR. TOUSLEY: They included this analysis in
13 their testimony. I'm trying to get an idea of what it
14 takes to have a preferable site, in terms of population.

15 JUDGE LINENBERGER: To the extent that the
16 witness can and will answer that question, I think it
17 might shed some light on -- with respect to the methodology
18 of the Staff, even though there may be sites involved
19 that are not explicitly Clinch River. But we're
20 interested in methodology, as well as specifics here.

21 JUDGE MILLER: You may answer.

22 WITNESS SOFFER: Could you repeat the
23 question?

24 BY MR. TOUSLEY:

25 Q Amongst the universe of plant sites which

15-7
1 meet the standards of 10 CFR Parts 50 and 100, would the
2 best of those sites be preferable to the worst, in terms
3 of population?

4 BY WITNESS SOFFER:

5 A In my opinion, I would put it in somewhat
6 reverse fashion. I would say that the highest population
7 density sites might be a matter of some additional con-
8 cern or some additional level of review.

9 Consequently, I would say that we would tend
10 to focus regulatory concern or actions on high populated --
11 on extremely high or extraordinarily high population
12 density sites rather than focusing attention on the very
13 low population density sites.

14 That was the case in the SECY paper, where
15 recommendation was made that the plants falling into the
16 two highest groups should be -- there should be special
17 risk analyses that ought to be pursued for those plants.

18 Q And that's true even though they meet the
19 siting standards in Parts 50 and 100?

20 BY WITNESS SOFFER:

21 A They meet the siting standards in Part 100.
22 I might also point out, by way of additional information,
23 that most of the plants in Categories 5 and 4 -- the above-
24 average plants -- did not meet the trip levels of
25 Regulatory Guide 4.7.

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Q So if they were being analyzed today using that Reg Guide, they would not be sited?

BY WITNESS SOFFER:

A I can't say that. All I can say is that from -- is if they were being offered today as proposed sites, we would request that alternative sites with lower populations be demonstrated as to why the Applicant should not site the plant there.

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1 Q And if the proposed rule on alternative
2 sites were being used in the analysis and the eight
3 criteria on Page K-9 were applied to select candidate
4 sites, then those sites would not satisfy the criteria
5 to even be candidates; is that correct?

6 BY WITNESS SOFFER:

7 A That's my understanding.

8 Q Mr. Leech, can you tell me generally what is
9 the regulatory status of the proposed rule on alternative
10 sites?

11 I understand it isn't formally adopted by the
12 Commission.

13 BY WITNESS LEECH:

14 A The proposed rule was issued in --

15 Q I'm sorry. I didn't understand.

16 BY WITNESS LEECH:

17 A The proposed rule was issued in a draft
18 form for comment. Comments were received. I understand
19 that the people who are responsible for developing
20 the final rule still have that in process.

21 Q I see. And how is the Staff using the
22 rule at present?

23 BY WITNESS LEECH:

24 A At the present time?

25 Q Yes.

1 BY WITNESS LEECH:

2 A We are using it for guidance in conducting
3 alternative site reviews. It has been used -- in addition
4 to Clinch River, it has been used on the Hanford
5 site.

6 It represents our current thinking on how best
7 to approach in an orderly fashion and a consistent fashion
8 the subject.

9 Q Is the Staff applying the provisions of the
10 rule uniformly in its use of it as guidance, or are they
11 used selectively?

12 BY WITNESS LEECH:

13 A Well, as I say, I'm only aware of two cases
14 where it has been used. And as far as I know, they're
15 consistent with each other.

16 In this case, Clinch River -- of course, we
17 have the overriding orders from the Commission itself
18 that instruct us about the extent to which we are to
19 consider alternative sites.

20 Q In your view, is the proposed rule -- does
21 it conflict with the Commission's order --

22 MR. EDGAR: Objection. They're asking Mr.
23 Leech for a legal opinion on the Commission's order.

24 JUDGE MILLER: No, I don't interpret it as
25 being a request for a legal opinion, for his opinion, if

1/ he has one, not as a lawyer, however.

2 Do you have an opinion?

3 WITNESS LEECH: I'm not aware of any important
4 area in which they are in conflict.

5 BY MR. TOUSLEY:

6 Q Are you aware of any instance in which the
7 Staff has elected not to apply any of the provisions of
8 the proposed rule in the Clinch River case?

9 BY WITNESS LEECH:

10 A Well, we have to tried to follow it fairly
11 closely.

12 JUDGE MILLER: What's the purpose of that
13 inquiry? I'm not at all convinced that the rule itself
14 is necessarily binding in this case. I've already told
15 you that we think we have the law of the case from the
16 action of the Commission on Clinch River.

17 Now, we've let you have considerable inquiry,
18 and I'm aware that the testimony filed has gone into the
19 proposed rule.

20 But, frankly, they are far from being central
21 to the scope of this Board's inquiry.

22 MR. TOUSLEY: Well, I was just trying to get
23 a better understanding of how the Staff has been using
24 the rule. It has been --

25 JUDGE MILLER: What difference does it make?

1 MR. TOUSLEY: Well --

2 JUDGE MILLER: We don't care really how they've
3 been using it one way or the other. We're looking at
4 this, Clinch River, first-of-a-kind matter. We've got
5 guidance from the Commission, our highest authority, on
6 this particular first-of-a-kind matter. So that's what
7 the Board is looking at.

8 Now, we've let you because of, (a) there may
9 be analogs and, (b) because the parties have put in --
10 perhaps unnecessary analyses out of an abundance of
11 caution -- whatever it may. The matter at best is peri-
12 pheral. And it's rapidly getting all beyond the peri-
13 phery.

14 MR. TOUSLEY: Well, my question was based on
15 the heavy use of the rule by both Applicants and the
16 Staff, so ...

17 JUDGE MILLER: Well, you've given heavy cross-
18 examination. Maybe you're about equal now. If you've
19 got anything further, however, with regard to the guidance
20 of the Commission -- that is definitely given us in this
21 case -- you may pursue it.

22 But not, I would say, farther as far as the use of
23 non-use in light water reactors of the rule and proposed
24 rule.

25 MR. TOUSLEY: May I have a moment, please?

15-13

JUDGE MILLER: Yes, surely.

(A short recess was taken.)

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6-1 1 JUDGE MILLER: All right. Are you ready to
ed 2 resume, Mr. Tousley?

3 MR. TOUSLEY: Yes.

4 BY MR. TOUSLEY:

5 Q Is it a fair -- I'm not sure who to address
6 this to, so everyone....

7 Is it a fair characterization of the Staff's
8 position that any terrestrial impact advantage of
9 building the breeder at an already cleared site where
10 another project has been canceled would be unimportant
11 because the expected terrestrial impacts at Clinch River
12 are not significant?

13 BY WITNESS LEECH:

14 A That is correct.

15 Q Is it a fair characterization of the Staff's
16 position concerning the relative effects on water quality
17 at the various sites, that the Staff doesn't consider
18 any differences among the sites significant, because
19 the effects at Clinch River are expected to be negligible?

20 BY WITNESS LEECH:

21 A I am not sure we have ranked all the
22 alternatives in that manner. I would have to check.

23 Q Did the Staff find any of the other sites to
24 be preferable to the Clinch River site in terms of water
25 quality?

1 BY WITNESS LEECH:

2 A I will check that.

3 Referring to Table L.1 on Page L-51, column
4 "Parameter 1" as it is labeled, is water use and quality.
5 It's a combined assessment having to do with water
6 availability, water use and the effects on quality.

7 This table does not separate out those two
8 things, one from the other, but as you can see, there are
9 three sites which were just judged to be slightly
10 preferable to Clinch River with respect to Parameter 1.

11 To find out whether any of those three were
12 considered preferable for water quality only, we would have
13 to go to each one of those discussions

14 Q Did the Staff consider the water quality ad-
15 vantage of any of these alternatives to be significant?

16 BY WITNESS LEECH:

17 A Well, let me check and see of those three.

18 In the case of Yellow Creek, if you look at
19 Page L-28 at the top of the page, you see the notation
20 that, "Because attainment of state water quality
21 standards resulted in no special mitigating requirements
22 at Yellow Creek, this site is slightly better than the
23 proposed Clinch River site relative to impact on water
24 quality."

25 Now let me take a look at Hanford.

6-3
1 On Page L-34 at the top of the page, it
2 says, "The slightly better water quality in the Columbia
3 River relative to the Clinch and the substantially higher
4 dilution flow in the Columbia would appear to give the
5 Columbia an environmental advantage. However, because the
6 Clinch River site can accommodate the breeder project with
7 no significant adverse water quality impact on other uses,
8 the apparent advantage does not weigh heavily in
9 selecting among the alternatives."

10 Now, the Savannah River plant is the last
11 one.

12 On Page L-44 under "Water Quality," the
13 third paragraph of that Section 2.3.2.1: "In comparison
14 to the Clinch River, the Savannah River is of slightly
15 better quality in terms of content of dissolved
16 inorganics and provides a higher minimum flow to dilute
17 discharges. However, because water quality changes were
18 concluded to have negligible impact at the Clinch River
19 site, these differences should not weigh heavily in
20 comparison of alternatives."

21 Q Okay. So that answers my question, yes. Because
22 impacts at Clinch River were determined to be low, the
23 differences are not significant; is that correct?

24 BY WITNESS LEECH:

25 A I think in essence that is the case; certainly

6-4 1 not substantially significant. Shall I put it that way?

2 Q And the same question with respect to aquatic
3 resources. I believe the Table L.1 found only the Idaho
4 site was preferable to the Clinch River site.

5 BY WITNESS LEECH:

6 A With respect to aquatic impacts.

7 Q And did you conclude that that advantage was
8 not significant because the aquatic impacts at Clinch
9 River would be negligible?

10 BY WITNESS LEECH:

11 A In essence, that's correct.

12 MR. TOUSLEY: I have no more questions.

13 JUDGE MILLER: Thank you.

14 Applicants?

15 MR. EDGAR: We have no questions.

16 JUDGE MILLER: Any redirect?

17 MR. MIZUNO: Yes.

18 REDIRECT EXAMINATION

19 BY MR. MIZUNO:

20 Q Mr. Leech, turning to Page 9-13 and 9-14 of
21 the 1982 FES Supplement.

22 BY WITNESS LEECH:

23 A Yes.

24 Q In particular, turning to Page 9-14, Table A9.5,
25 this table represents the NRC Staff estimates of costs for

6-5
1 relocation of Clinch River to alternative sites; is that
2 true?

3 BY WITNESS LEECH:

4 A Yes.

5 Q And is it true, also, that you derived the
6 numbers for cost impacts of moving in part from Table A9.4?

7 BY WITNESS LEECH:

8 A Yes.

9 Q Is it also true that the Staff adjusted the
10 numbers which were provided to the Staff by the
11 Applicants based on its own judgment, certain of the
12 numbers?

13 BY WITNESS LEECH:

14 A Certain of the numbers, yes.

15 Q Mr. Spickler, do you recall your discussion
16 about the models for calculating X/Q values?

17 BY WITNESS SPICKLER:

18 A Yes, I do.

19 Q And you indicated that the X/Q values shown
20 in the 1982 FES Supplement were calculated using different
21 models than the X/Q values calculated for the 1977 FES?

22 BY WITNESS SPICKLER:

23 A Site Suitability Report.

24 Q Site Suitability Report?

25 /

6-6
1 BY WITNESS SPICKLER:

2 A Yes.

3 Q Okay. Are those new models for calculating
4 X/Q values preferable to the old models which were used?

5 MR. TOUSLEY: Objection. He is leading the
6 witness.

7 JUDGE MILLER: It is leading. You are
8 entitled on redirect to lead slightly in the sense of
9 calling the witness' attention to his prior testimony and
10 the like, but you can't go too far in suggesting the
11 answer.

12 So rephrase the question.

13 MR. MIZUNO: Okay.

14 BY MR. MIZUNO:

15 Q How do the new models compare with the old
16 models in terms of preferability for calculating X/Q
17 values?

18 BY WITNESS SPICKLER:

19 A We feel they are preferable, and we feel
20 that they are preferable because the Regulatory Guide
21 1.145 was based on a thorough examination of all of the
22 diffusion experiments that were available, that were made
23 during low wind speed meteorological conditions; and,
24 therefore, are more appropriate than the values that we
25 used previously, which were interim values, in the '77

6-7 1 report.

2 Q Mr. Soffer, do you recall your discussion of
3 risks due to accidents in Appendix J?

4 BY WITNESS SOFFER:

5 A Yes.

6 Q I heard you to say that the Staff found that
7 there were high risks due to accidents from the accidents
8 calculated in Appendix J.

9 Did you mean to say that?

10 BY WITNESS SOFFER:

11 A No, that was a mistake. If I said that, I
12 misspoke.

13 I meant to say that the risks were very low.

14 Q Okay. Mr. Soffer, turning to your testimony
15 on Page 22, Question 45 and Answer 45.

16 BY WITNESS SOFFER:

17 A Yes.

18 Q Do you recall the discussion where you
19 provided the basis for your conclusion of not attaching
20 significance to differences in population density?

21 BY WITNESS SOFFER:

22 A Yes.

23 Q Was one of the bases for your conclusion --

24 JUDGE MILLER: Well, I think you better ask
25 him what were the bases for his conclusion, or you are

6-8
1 going to get into leading again.

2 MR. MIZUNO: Okay.

3 BY MR. MIZUNO:

4 Q I believe you discussed the bases for your
5 conclusion. Would you care to reiterate them at this time?

6 BY WITNESS SOFFER:

7 A Yes. We performed an analysis of population
8 for each of the alternative sites that was given in
9 Appendix L in various subsections under each of the
10 alternative sites.

11 A comparison was made for the alternative site.
12 The Regulatory Guide 4.7 trip level and the discussion
13 concluded that for each of the alternative sites, they
14 were below the trip levels of Regulatory Guide 4.7, and
15 the Staff concluded on that basis that since the risk
16 associated with the Clinch River site was very low,
17 there were no significant differences for the alternative
18 site, although in fact the numbers at the alternative site
19 might conceivably be lower.

20 Q So the Staff did consider population?

21 BY WITNESS SOFFER:

22 A Absolutely. Consideration of population has
23 been made in Appendix L of the FES Supplement.

24 MR. MIZUNO: No further questions.

25 JUDGE MILLER: Any redirect?

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MR. TOUSLEY: We might have one question on
recross. Just a moment.

JUDGE MILLER: I'm sorry. I meant recross.

- - -

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17 -1

RECROSS-EXAMINATION

2 BY MR. TOUSLEY:

3 Q Mr. Spickler, in your answer you just gave
4 about the models used to calculate X/Q values, can you tell
5 me if those are flat land models or do they take into
6 account peculiar terrain?

7 BY WITNESS SPICKLER:

8 A They've been done in several different sites,
9 including the experiments at the Clinch River Breeder
10 Reactor site.

11 So, the values are particularly applicable for
12 the breeder reactor site .

13 The experiments were done at various different
14 types of sites.

15 Q There wasn't any uniform methodology of the
16 sites considered?

17 BY WITNESS SPICKLER:

18 A I don't understand what you mean.

19 Q Well, you say there were experiments done at
20 Clinch River.

21 BY WITNESS SPICKLER:

22 A Yes.

23 Q Are you saying that the model was changed
24 somewhat at Clinch River or --

25

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17-2
1 BY WITNESS SPICKLER:

2 A No, no. I said that when the data from the
3 Clinch River experiments were factored into the Regulatory
4 Guide with data from other sites, where other similar
5 diffusion experiments were performed, places like Idaho,
6 like Hanford, like -- I'm trying to think of other places
7 -- Rancho Seco , Palo -- there are quite a list of
8 sites that are referenced in the Guide.

9 Q Mr. Stickler, do you mean Palo Verde?

10 BY WITNESS SPICKLER:

11 A What did I say?

12 Q Palo.

13 BY WITNESS SPICKLER:

14 A No. I meant Palo. I meant the Duane Arnold
15 site.

16 Q Okay.

17 MR. TOUSLEY: That's all.

18 JUDGE MILLER: Applicant.

19 MR. EDGAR: No questions.

20 JUDGE MILLER: Dr. Hand.

21 BOARD EXAMINATION

22 BY JUDGE HAND:

23 Q Mr. Leech, when Mr. Tousley was talking to you
24 earlier on, the topic of flow in the Clinch River was
25 mentioned.

17-3

1 How do you get a no-flow condition at Clinch
2 River?

3 BY WITNESS LEECH:

4 A Milton Hill Dam is just upstream from the
5 Clinch River site and, basically, the flow comes down from
6 Milton Hill Dam.

7 If the turbines there are turned off, you get
8 essentially no flow from the Milton Hill Dam but in
9 actuality, it is true that there are small streams that
10 come into the Clinch River, at least one, below the dam.

11 So you don't have absolutely zero. But it can
12 come virtually to zero.

13 Q Are there dams below the Clinch River site?

14 BY WITNESS LEECH:

15 A Yes.

16 Q So that you could have a lake effectively?

17 BY WITNESS LEECH:

18 A Yes.

19 Q How often does that sort of condition exist?
20 Has it existed?

21 BY WITNESS LEECH:

22 A Well, first of all, in the past, according
23 to the statistics, there have been quite a few cases over
24 the years where Milton Hill Dam has -- where it has ceased
25 releasing water for fairly extended periods but

17-4
1 practically every day, I believe, there is perhaps a short
2 period in which it may shut down, in that they shut down
3 the turbines for brief periods.

4 Q How long are fairly extended periods?

5 BY WITNESS LEECH:

6 A I think the record is 29 days but that was
7 for the purpose of treating mill foil , as I understand
8 it.

9 Q Is there no way to cause the water to flow when
10 the turbines are down?

11 BY WITNESS LEECH:

12 A I really don't know the answer to the operation
13 of that dam. However, extended periods of no-flow as the
14 documents reveal, the ER particularly, extended periods
15 are no longer contemplated because they don't intend to
16 treat mill foil in that way again.

17 Instead, they will have some other means of
18 going it, if they have that problem again.

19 Q Well, under a period when there is no flow
20 and if the CRBR were operating, how much of a cross section
21 of the Clinch River near the plant could be affected by
22 the effluent?

23 BY WITNESS LEECH:

24 A You're speaking of no-flow?

25 Q Yes.

1 BY WITNESS LEECH:

2 A Our analysis in the old FES shows that you
3 could have an isotherm, which I believe is as low as .5
4 degrees above, let's say, no release at all. Go over to
5 the opposite shore and go some distance in both directions.

6 Q How about vertically?

7 BY WITNESS LEECH:

8 A Vertically. Not far at all. They say in the
9 upper third of the river, as I recall it.

10 Q Do you know the normal high temperature of
11 Clinch River in this stretch we're talking about?

12 BY WITNESS LEECH:

13 A I think the highest of record is 78 degrees
14 Fahrenheit.

15 Q 78 degrees, and what sort of temperature
16 differential is the effluent water as compared to the intake
17 water for the Clinch River?

18 BY WITNESS LEECH:

19 A Well, after the mixing zone, it's some small
20 number. Like 1.3 degrees.

21 At the discharge into the river, I have forgotten
22 the number. It is 17 or 23. One or the other, I think is
23 the case, but there is a rather short mixing zone and the
24 mixing zone starts out from the discharge and then it goes --
25 if you were having any flow, it goes in parallel to the

1 bank.

2 Q It's not a single point discharge? It's a
3 diffused discharge of some sort?

4 BY WITNESS LEECH:

5 A I think it is a single point discharge but let
6 me look and see.

7 It's called a submerged single point discharge
8 structure and it appears to be a straightforward pipe,
9 jutting out.

10 Q At what depth? Is that obvious from what you
11 are reading?

12 BY WITNESS LEECH:

13 A It shows a minimum freeboard of four feet at
14 low water. Elevation 735 is the low water but at the two
15 foot clearance from the bottom.

16 Q So it is this discharge entry --

17 BY WITNESS LEECH: Let me make sure that's the up to date number.
18 A Let me make sure that's the up to date number.
19 It may be that has been changed, but for your being able
20 to see it, it's on Page 3-9 of the old FES.

21 What I said was correct. The only dimension
22 that has changed is the dimension across the top view of
23 the structure. For some reason or other, in the design
24 it shows a 39 foot width, whereas, it was formerly 29 feet.
25 The pipe, of course, is not that wide. I don't know the

1 width of it.

2 Q There were some comments earlier about fish
3 possibly avoiding this warm area and concerns apparently
4 that it might represent potentially lethal temperatures
5 for the fish, I judge.

6 Is something known about the behavior of
7 striped bass or any other fish in that river that says,
8 in fact, they will not just keep on swimming, hot or cold?

9 BY WITNESS LEECH:

10 A I believe that the evidence is that the fish
11 will, indeed, keep on swimming, hot or cold.

12 However, in the period of no-flow for extended
13 periods, ten days or more, so you can get an equilibrium
14 temperature across the river and on the hottest temperature
15 in the river itself, ambient-wise; maximum heat discharge from
16 the plant, all of those three things together, you have
17 the possibility that some striped bass might be affected
18 if they're going to sit there for a while in that condition.

19 Now, actually, as I understand it from talking
20 to our biologist, Dr. Mastic, it is unlikely we are going
21 to see any really adverse effect because the fish are not
22 certainly going to sit there, but it is true that they use
23 it as a cool water refuge in that hot time of the year
24 and they have a tendency to collect or stay along the far
25 side near the river bank.

1 Now, as I also understand it, the fish that
2 are likely to be affected are older -- are the older,
3 larger striped bass.

4 There is some uncertainty about them.
5 Apparently, they have a little lower threshold the older
6 they get.

7 Q I gather this is not a closed topic? That
8 there are still studies underway.

9 BY WITNESS LEECH:

10 A The TVA is making studies.

11 Q One reason for being intrigued is, there's a
12 fossil fuel power plant at Hunter's Point in San
13 Francisco Bay, and I used to drive past that or nearby it
14 on the way to the airport and it was a common sight early
15 in the morning when there was not ordinarily fog over
16 the water, to see a bunch of boats sitting along a little
17 foggy belt close to the power plant and here were these
18 striped bass, which apparently they were catching in the
19 warm water. They were attracted to the warm water.

20 BY WITNESS LEECH:

21 A One of the best fishing spots there is.

22 (Laughter.)

23 BY JUDGE HAND:

24 Q I just wondered if perhaps the striped bass
25 was suicidal.

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(Laughter.)

BY JUDGE HAND:

Q If environmental circumstances would let the effluent be at a level that might be a lethal challenge to the fish, whether or not they would simply aggregate there and die.

BY WITNESS LEECH:

A I should think that fish must have some sort of sense.

(Laughter.)

JUDGE MILLER: The better educated.

JUDGE HAND: That's all. Thank you.

JUDGE MILLER: Judge Linenberger.

BY JUDGE LINENBERGER:

Q Well, in the same vein, in the first place, I gather that the no-flow circumstances you were just discussing with Judge Hand, don't carry the implication of a no water circumstance.

Now, historically, have there been with the existing dams, since the installation of existing dams, have there been periods of zero water of sufficient frequency to be of any concern?

BY WITNESS LEECH:

A I'm not aware of any such thing.

Q Incidentally, these questions are open for

1 any of you who have something to contribute.

2 Let's talk about normal flow, whatever that
3 means. Perhaps average flow of some sort.

4 In the stretch of water of interest here near
5 the plant, plant outfall, has there been any modeling of
6 the thermal plume for average flow conditions, such as to
7 give one a clue whether the fraction of the river that is
8 covered by the plume would, indeed, leave a safe passage
9 through cooler water for fish traveling along the stream?

10 Has this been modeled in any way that you
11 know of?

12 BY WITNESS LEECH:

13 A I'm not sure of the particular situation
14 you've mentioned, where you said an average flow.

15 In Chapter 2 of the old FES you find the reports
16 of some modeling, well, first of all, you find the basic
17 data and then I guess if you go to Chapter 5, you will find
18 the results of the plume modeling and the plumes
19 themselves, with an average flow.

20 Of course, a plume is not going to reach the
21 other bank but I can tell you where that might be found.

22 On Page 5-7 you will see that the plume area
23 is very small. Here we have shown the plumes for some
24 typical and worst situations in winter and summer.

25 Q Okay. Fine.

17-11

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1 Mr. Spickler, traditionally testimony
2 regarding analyses such as yours has involved a gent by the
3 name of Pasqual and I'm wondering -- I don't recall seeing
4 him anywhere in your testimony.

5 Is he out of favor these days or is he there
6 implicitly?

7 BY WITNESS SPICKLER:

8 A He's there implicitly.

9 Q And his role hasn't changed, even though you
10 don't mention his name?

11 BY WITNESS SPICKLER:

12 A It's a given.

13 Q Okay.

14 BY WITNESS SPICKLER:

15 A The sigma Y and sigma Z curves that are used
16 in the diffusion calculations are based on Pasqual's
17 values. The values that were -- that are derived from
18 Pasqual's work and they are still utilized to this day,
19 so --

20 THE REPORTER: I'm sorry, you're going to
21 have to speak up.

22 WITNESS SPICKLER: I'm sorry.

23 The sigma Y and sigma Z values that are
24 basically used in diffusion equations, are all based on
25 work derived from Pasqual's original work, so that the

1 sigma Y and sigma Z curves that are used in the diffusion
2 equations are Pasqual's.

17-12

3 BY JUDGE LINENBERGER:

4 Q Okay .

5 And the upgrading of the calculational models
6 you talked about earlier, did not involve any change in
7 the application of these Pasqual stability considerations?

8 BY WITNESS SPICKLER:

9 A Well, they are empirical values that are
10 multiplied by the sigma Y values. There's a set of curves,
11 of correction factors for plume meander for G, F, E and
12 D stabilities versus wind speed in the Reg. Guide 1.145
13 and they are just numbers that are multiplied times the
14 appropriate sigma Y values from the original Pasqual
15 curves at a given distance.

16 Q Yes, but my question was -- and maybe I'm
17 confusing things here but I didn't think I heard your
18 answer --

19 Did the upgrading of the model between the
20 earlier Reg. Guide and the newer one involve any kind of
21 different treatment of these curves?

22 BY WITNESS SPICKLER:

23 A It did.

24 As I said, we increased the amount of diffusion
25 that you would expect in the lateral, by these values,

1 these plume meander factors.

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JUDGE LINENBERGER: Fine. Thank you. I've
got you.

That's really all I have.

JUDGE MILLER: Thank you.

Any reason why we can't excuse this panel?

(No response.)

JUDGE MILLER: Offer --

MR. MIZUNO: The Staff would now like to
offer Staff Exhibits 15 and 16.

JUDGE MILLER: Any objections?

MR. TOUSLEY: No objections.

MR. EDGAR: None.

JUDGE MILLER: They will be admitted. Staff
Exhibits 15 and 16.

(Staff Exhibits Nos. 15 and 16
were received in evidence and
follow.)

4865

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

UNITED STATES DEPARTMENT OF ENERGY
PROJECT MANAGEMENT CORPORATION
TENNESSEE VALLEY AUTHORITY

(Clinch River Breeder Reactor
Plant)

Docket No. 50-537

JOINT TESTIMONY OF CHARLES FERRELL, HOMER LOWENBERG
LEONARD SOFFER AND IRWIN SPICKLER
ON CONTENTIONS 5(a) AND 7(c)

Q.1. Mr. Ferrell, please state your position, your employer, and the nature of your work?

A.1. I am employed by the U.S. Nuclear Regulatory Commission ("NRC") as a Site Analyst in the Siting Analysis Branch, Division of Engineering. My duties include the evaluation of the reactor site, exclusion area control, population and nearby industrial, transportation and military facilities. A statement of my professional qualifications is attached to this testimony.

Q.2. What is the nature of your responsibilities regarding the Clinch River Breeder Reactor?

A.2. I was the Site Analyst assigned to the Clinch River Breeder Reactor Project. I was responsible for, or contributed to, the review of the exclusion area, demography, off-site transportation, and industrial and military facilities for CRBR and alternate sites for CRBR. These reviews and contributions are in Sections III A, III B

and III C of the Clinch River Breeder Reactor Site Suitability Report ("SSR"), Sections 2.1 and 2.2 of the Applicant's Environmental Report ("ER"), and Section 9 and Appendix L of the 1982 Supplement to the Final Environmental Statement ("FES") for CRBR ("FES Supplement").

Q.3. Mr. Lowenberg, by whom are you employed, and what is your position; and what is the nature of your work?

A.3. My name is Homer Lowenberg, Chief Engineer for the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission ("NRC").

I am a graduate of Stevens Institute of Technology with degrees in mechanical and chemical engineering and am a professional engineer in the states of Pennsylvania and New York. I have over 25 years experience in the commercial design, construction and operation fields related to a wide variety of nuclear facilities for both the government and industry. Particularly relevant commercial experience includes major responsibilities with regard to the design and construction of a number of reprocessing and fuel fabrication facilities: for the U.S. government at Richland, Washington and Oak Ridge, Tennessee; for the Italian, Swedish and Indian governments; and for a division of the Atlantic Richfield Co.

For the past ten years I have been employed by the Atomic Energy Commission and the NRC. Relevant government experience includes my

assignments as assistant director and chief engineer in licensing of commercial nuclear fuel material activities. I was the program manager for NRC's generic analysis of mixed oxide fuel use in light water reactors (GESMO); a member of the U.S. delegation to the International Fuel Cycle Evaluation for the area of fuel reprocessing and recycle; and am involved in the TMI-2 Waste Management Task Force. Further details of my background are contained in my statement of professional qualifications.

Q.4. What is the nature of the responsibilities you have regarding the Clinch River Breeder Reactor ("CRBR")?

A.4. I am the Office of Nuclear Materials Safety and Safeguards ("NMSS") Project Manager responsible for the preparation of the Fuel Cycle portion of the supplement to the Final Environmental Statement ("FES") for the CRBR Plant. I directed and participated in the review of the applicant's updated environmental report related to the various steps in the CRBR fuel cycle including: 1) fuel fabrication, 2) reprocessing, 3) waste management, 4) transportation, and 5) safeguards. In particular, I directed the updating of Appendix D, "Environmental Effects of the CRBR Fuel Cycle and Transportation of Radioactive Materials"; Appendix E, "Safeguards Related to the CRBR Fuel Cycle and Transportation of Radioactive Materials"; section 7.2, "Transportation Accidents Involving Radioactive Material"; section 7.3, "Safeguards Considerations"; as well as section 5.7.2.6, "Transportation of Radioactive Materials";

and section 5.7.2.7, "Fuel Cycle Impacts" of the FES. In addition, I was responsible for the review of section 11.9.5 of the 1977 FES.

0.5. Mr. Soffer, please state your position, your employer, and the nature of your work?

A.5. I am Section Leader of the Site Analysis Section, Siting Analysis Branch, Division of Engineering, Office of Nuclear Reactor Regulation ("NRR"), of NRC. I am responsible for the review of the population characteristics of nuclear power reactor sites, including the exclusion area, as well as the review of nearby industrial, transportation and military facilities. A statement of my professional qualifications is attached to this testimony.

Q.6. What is the nature of your responsibilities regarding the CRBR?

A.6. I am Mr. Ferrell's immediate supervisor. In this capacity I supervised the review of the exclusion area, population characteristics and nearby industrial, transportation and military facilities of the Clinch River site as well as for each of the alternative sites analyzed for the CRBR. These reviews and contributions are in Sections IIIA, IIIB and IIIC of the Clinch River Breeder Reactor Site Suitability Report ("SSR"), NUREG-0786, Sections 2.1 and 2.2 of the Applicant's Environmental Report ("ER"), and Section 9 and Appendix L of the 1982 Supplement to the Final Environmental Statement ("FES") for the CRBR ("FES Supplement"). I am also responsible for evaluating underground siting of the CRBR as an

alternative and my contribution in this regard appears in Section 11 of the FES Supplement.

Q.7. Mr. Spickler, please state your position, your employer, and the nature of your work?

A.7. My name is Irwin Spickler. I am the Leader of the Meteorological Section, Accident Evaluation Branch, Assistant Directorate for Radiation Protection, Division of Systems Integration, NRR, of NRC. I supervise the review of the meteorological aspects of nuclear reactor licensing actions. A statement of my professional qualifications was received into evidence during the hearing session commencing August 23, 1982 (Tr. 2541).

Q.8. What is the nature of your responsibilities regarding the CRBR?

A.8. I was responsible for the meteorological review for CRBR, as presented in Sections 2.6, 5.3, 5.7, 6.1.3, 6.2.3, 9.2, 11.2, and Appendix L of the FES Supplement for CRBR.

Q.9. What is the subject matter of your testimony?

A.9. Our testimony addresses Joint Intervenors' Contentions 5(a) and 7(c). Contention 5(a) states:

Neither Applicants nor Staff have established that the site selected for the CRBR provides adequate protection for public health and safety, the environment, national security, and national energy supplies; and an alternative site would be preferable for the following reasons:

- (a) The site meteorology and population density are less favorable than most sites used for LWRs.
- (1) The wind speed and inversion conditions at the Clinch River site are less favorable than most sites used for light-water reactors.
 - (2) The population density of the CRBR site is less favorable than that of several alternative sites.
 - (3) Alternative sites with more favorable meteorology and population characteristics have not been adequately identified and analyzed by Applicants and Staff. The analysis of alternative sites in the ER and the Staff Site Suitability Report gave insufficient weight to the meteorological and population disadvantages of the Clinch River site and did not attempt to identify a site or sites with more favorable characteristics.

Contention 7(c) states:

- c) Alternative sites with more favorable environmental and safety features were not analyzed adequately and insufficient weight was given to environmental and safety values in site selection.
- (1) Alternatives which were inadequately analyzed include Hanford Reservation, Idaho Reservation (INEL), Nevada Test Site, the TVA Hartsville and Yellow Creek sites, co-location with an LMFBR fuel reprocessing plant (e.g., the Development Reprocessing Plant), an LMFBR fuel fabricating plant, and underground sites.

In particular, our testimony will discuss the applicable NRC criteria for meteorology and demography and will show that the CRBR site meteorology and population density meet these criteria. Our testimony will compare these characteristics with those of other sites used for LWR's, and will present the bases for the Staff

conclusion that the site selected for the CRBR provides adequate protection for the public health and safety as well as the environment, and that there are no alternative sites that are environmentally preferable to the Clinch River site with regard to site meteorology and population density. Our testimony will also address the co-location and underground siting concepts.

Q.10. Mr. Spickler, is meteorological data specific to the CRBR site available to the NRC Staff ("Staff")?

A.10. Yes.

Q.11. Describe how this meteorological data was collected.

A.11. Since April 1973 a temporary 200-ft instrumented tower has been in operation southward of the reactor site. In February 1977, two permanent instrumented towers were installed: a 10 meter tower south of the site and a 110 meter tower southeast of the site. Simultaneous measurements were taken on the temporary and permanent towers during the period of February 16, 1977 to March 2, 1978. The 110 meter tower ^{were} ~~was~~ put back into service during April of 1982 and will operate during construction of CRBR. The 10 meter tower instrumentation consisted ^{of} ~~of~~ wind speed and wind direction sensors located at the 10 meter level. The 110 meter tower instrumentation consists of wind speed and direction sensors located at the 10, 60, and 110 meter levels; temperature sensors at the 10-, 60-, and 110-m levels; dew point sensors at the 10 meter level; and solar radiation ~~atmospheric pressure~~ and precipitation sensors at the 1

meter level. Additional information on the Applicants' meteorological monitoring program is provided in Section 6.1.3 of the FES Supplement.

The Staff analyzed the data collected on site on the permanent towers for the period February 17, 1977 through February 16, 1978. For that one year period, the joint data recovery rate of 10 meter wind speed and wind direction, and the temperature difference between the 10 meter and 60 meter levels, was 97 percent.

Q.12. Does the Applicants' onsite meteorological monitoring program, in terms of sensor accuracy, calibration intervals, and recovery rate meet the standards recommended in Regulatory Guide 1.23?

A.12. Yes.

Q.13. Please present the meteorological data for the CRBR site.

A.13. The CRBR site is characterized by a high frequency of stable atmospheric diffusion conditions, westerly winds, and low wind speeds which are typical of the northern Appalachian area of the Southeastern United States.

The joint frequency of wind speed direction and atmospheric stability during the period February 17, 1977 through February 16, 1978 are presented in Chapter 2.3 of the PSAR (Amendment 65, February 1982) and Chapter 2.6 of the ER (Amendment XI, January 1982). Stable atmospheric diffusion conditions (E, F & G) occurred

56 percent of the year. Neutral stability (D) and unstable (A, B & C) conditions occurred 36% and 8% of the year, respectively. The prevailing wind sectors are from the west, the WNW, W, WSW winds occurring ~~35~~²⁵%, 29%, and 26% of the year, respectively.

The annual 10 meter wind speed had an occurrence of winds less than 1.5 m/sec 60% of the time, winds less than 2.5 m/sec 80% of the time and winds less than 0.4 m/sec 3% of the time.

Q.14. How did the Applicants utilize this data to analyze the consequences of routine and accidental radiation releases?

A.14. The Applicants used the 10 meter wind speed and direction and the 10 to 60 meter temperature gradient data (atmospheric stability), measured on-site between February 17, 1977 through February 16, 1978, to determine the diffusion factor (X/Q) to be utilized in their analyses of the consequences of routine and accidental releases of radioactivity.

In evaluating the atmospheric transport and diffusion characteristics from routine radioactivity releases, the Applicants used a Straight-Line Trajectory Model, as described in Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors." All releases were assumed to be at ground level. The calculations also included an estimate of the maximum increase in

calculated relative concentration and deposition due to recirculation of airflow.

Short-term (up to 30 days) X/Q values were calculated by the Applicants in order to analyze the consequences of accidental releases, in accordance with the methodology described in Regulatory Guide 1.145. A direction dependent atmospheric dispersion model with enhanced lateral dispersion during neutral and stable atmospheric conditions accompanied by low wind speeds was used. X/Q values for each of the 16 cardinal point sectors that is not exceeded 0.5% of the total time were calculated by the Applicants. The highest of each of these 16 sector X/Q values was defined as the maximum ^{sector} ~~section~~ X/Q value, and was compared with the overall site X/Q that is exceeded no more than 5% of the total time. Whichever value was higher was used to determine the consequences of accidental releases at the exclusion zone boundary ("EAB") of 670 meters and outer boundary of the low population zone ("LPZ") of 4023 meters. For the Clinch River site the more conservative X/Q values were those based upon the 0.5% sector values and was thus utilized by the Applicants to evaluate the consequences of design basis accidental releases.

Q.15. What are the Applicants' calculated X/Q values at the EAB and the LPZ for analyzing the consequences of accidental releases?

A.15.	Accident X/Q Values		X/Q
	<u>Time Period</u>	<u>Distance (meters)</u>	<u>(sec/m³)</u>
	0-2 hours	EAB, 670 meters	1.1×10^{-3}
	0-8 hours	LPZ, 4023 meters	1.2×10^{-4}
	8-24 hours	LPZ, 4023 meters	8.4×10^{-5}
	1-4 days	LPZ, 4023 meters	3.7×10^{-5}
	4-30 days	LPZ, 4023 meters	1.2×10^{-5}

Q.16. What are the Applicants' calculated X/Q values for estimating the consequences of routine radioactivity releases?

A.16. The most limiting off-site annual average X/Q value calculated by the Applicants was 1.02×10^{-4} sec/m³ which was associated with winds from the southeast.

Q.17. Did the Staff verify the Applicants' calculated X/Q values?

A.17. Yes. The Staff utilized the same data base as utilized by the Applicants, and performed independent X/Q analyses in accordance with Regulatory Guides 1.111 and 1.145.

Q.18. What are the Staff's calculated X/Q values for CRBR at the EAB and LPZ?

A.18. Accident X/Q Values

<u>Zone</u>	<u>Distances (Meters)</u>	<u>Time Period</u>	<u>X/Q (sec/m³)</u>
EAB	670	0-2 hours	1.22×10^{-3}
LPZ	4023	0-8 hours	1.2×10^{-4}
LPZ	4023	8-24 hours	8.4×10^{-5}
LPZ	4023	1-4 days	3.9×10^{-5}
LPZ	4023	4-30 days	1.4×10^{-5}

Q.19. What was the Staff's calculated value for the most limiting off-site annual average X/Q value?

A.19. The Staff's calculated X/Q value in the most limiting off-site annual average case was 1.2×10^{-4} sec/m³.

Q.20. Does the Staff use the same methodology for calculating X/Q values for light water reactors ("LWRs")?

A.20. Yes.

Q.21. How do the X/Q values for the CRBR site compare with X/Q values for licensed LWR sites?

A.21. The diffusion conditions at the CRBRP are better than some of the LWR diffusion conditions that have already been permitted or licensed and are comparable to LWR sites in the general region.

Q.22. How did the Staff evaluate the diffusion characteristics of the potential alternate sites to CRBR?

A.22. The Staff made 2 comparisons to characterize diffusion conditions of each potential alternate site. First, the Staff reviewed the joint occurrences of stable atmospheric diffusion conditions and the average wind speeds for these conditions, because this combination of conditions largely determine the relative diffusivity of an area under the poorest diffusion conditions. A comparison of the frequency of stable atmospheric conditions and the average stable wind speed for each of the alternate sites is presented in the following table:

<u>Site</u>	<u>Frequency Stable Atmospheric Conditions (%)</u>	<u>Average Stable Wind Speed (MPH)</u>	<u>Source of Data</u>	<u>Period</u>
CRBR	56	4.4 3.1	CRBR PSAR	2/77-2/78
Hartsville	51	4.2	Hartsville PSAR	2/73-1/74
Murphy Hill	54	4.0	Bellefonte PSAR	11/72-10/73
Phipps Bend	54	3.2	Phipps Bend PSAR	2/74-1/75
Yellow Creek	52	3.6	Yellow Creek PSAR	7/74-6/75
Savannah River	44	5.4	Vogtle PSAR	12/72-12/73
Hanford	58	4.5	WPPS-2 PSAR	4/74-3/76
Idaho	57	5.4	PBF SER	1967 & 1968

Second, the Staff compared atmospheric dispersion conditions used for accident consequence assessments relative concentration (X/Q) values were obtained from the Staff SER for each alternate site or from an appropriate nearby site. The following table presents a comparison of X/Q calculations at EAB and LPZ of the alternate sites:

<u>Alternate Sites</u>	<u>EAB Distance (meters)</u>	<u>0.2 Hr.* (sec/m³)</u>	<u>LPZ Distance (meter)</u>	<u>0-8 Hr. (sec/m³)</u>	<u>8-24 Hr. (sec/m³)</u>	<u>1-4 Day (sec/m³)</u>	<u>4-30 Day (sec/m³)</u>
CRBR	670	1.22 E-3	4023	1.2 E-4	8.4 E-5	3.9 E-5	1.4 E-5
Bellefonte	914	1.8 E-3	3219	1.8 E-4	1.2 E-4	4.8 E-5	1.3 E-5
Hartsville	1220	4.9 E-4	4828	5.9 E-5	4.1 E-5	1.9 E-5	6.2 E-6
Phipps Bend	760	1.8 E-3	4827	1.2 E-4	8.0 E-5	3.5 E-5	1.1 E-5
Yellow Creek	695	1.5 E-3	4828	6.4 E-5	3.5 E-5	1.2 E-5	2.4 E-6
Vogtle	1098	1.8 E-4	3220	3.3 E-5	2.2 E-5	9.2 E-6	2.8 E-6
WPPS-2	1950	1.7 E-4	4829	3.8 E-5	2.8 E-5	1.4 E-5	5.3 E-6

*Table Values are expressed as follows: $2.3 \text{ E-3} = 2.3 \times 10^{-3}$

Data from the Bellefonte nuclear power plant site, which is across the lake from Murphy Hill, was utilized in the two previous tables to represent the Murphy Hill site. Data from the Vogtle nuclear power plant site, which is in the same general area as the Savannah River site, has been utilized to represent the Savannah River site. Data from WPPS-2 has been utilized to represent both Hanford and Idaho because the occurrence of stable diffusion conditions and the average wind speeds were the approximately the same, and because both sites are in areas which are characterized by desert diffusion parameters.

From the above tables it can be seen that the five TVA area sites (CRBR, Murphy Hill, Hartsville, Phipps Bend and Yellow Creek) all have comparable accident X/Q values. All have comparable stable

atmospheric diffusion occurrence frequencies and average stable wind speeds, ^{comparable} ~~as~~ ^{except for Clinch River.} The Savannah River site has significantly less frequent stable conditions with higher wind speeds and shows significantly better diffusion conditions. Hanford and Idaho have high stable atmospheric diffusion frequency with a higher average wind speed. Based upon extensive diffusion studies at both Idaho and Hanford, it has been found that desert diffusion is better than non-desert locations and a different set of diffusion parameters (sigma y and sigma z) have been developed for desert areas. Thus, the accident diffusion conditions at both Hanford and Idaho are better than the TVA area sites.

Q.23. Mr. Soffer, what criteria are utilized by the Staff for evaluating the siting of nuclear power reactors?

A.23. The Staff utilized the Commission's criteria for determining the suitability of proposed sites for nuclear power plants contained in 10 C.F.R. Part 100. Proposed sites are required to meet certain tests related to the surrounding population.

A site is required to have an exclusion area surrounding the reactor where resident individuals are excluded. The Applicants must also define a low population zone ("LPZ") immediately beyond the exclusion area. In addition, the distance from the reactor to the nearest population center must be at least one and one-third times the low population zone outer radius, and the radiological consequences of an assumed hypothetical fission

product release must meet certain dose guidelines to an individual located at the boundaries of the exclusion area and the low population zone.

Q.24. What is the exclusion area for CRBR, as defined by the Applicants?

A.24. The Applicants have specified the exclusion area as a 1364 acre tract of land in Roane County, Tennessee, as described in section 2.1 of the ER and the PSAR, and described in section II.A of the Staff Site Suitability Report (SSR), NUREG-0786.

Q.25. Does the Staff agree with the Applicants' definition of the CRBR exclusion area?

A.25. Yes.

Q.26. What is the low population zone ("LPZ"), as defined by the Applicants?

A.26. The Applicants have specified the LPZ as a circular area with a radius of 2.5 miles centered on the proposed reactor.

Q.27. Does the Staff agree with the Applicants' definition of the LPZ?

A.27. Yes.

Q.28. What is the population center for the CRBR and the population center distance for CRBR as calculated by the Applicants?

A.28. The nearest population center has been designated to be Oak Ridge, Tennessee. The population center distance designated by the Applicants is 7 miles in the north-northeast direction.

Q.29. Does the Staff agree with the Applicants' identification of the population center for CRBR, and the Applicants' calculated population center distance?

A.29. Yes.

Q.30. Does the exclusion area, LPZ, and population center distance comply with NRC regulations?

A.30. Yes. The exclusion area and LPZ meet the definitions given in 10 C.F.R. Part 100. In addition, the population center distance of 7 miles is at least one and one-third times the LPZ outer radius of 2.5 miles. Even if future population growth results in a population center distance of 5 miles, this value will also meet the requirement of 10 C.F.R. Part 100.

Q.31. Has the Staff compared the exclusion area, LPZ, and population center distance for the CRBR site with other LWR sites?

A.31. Yes.

Q.32. How does the size of the CRBR exclusion area compare with those of other LWR sites?

A.32. The minimum distance from the CRBR reactor to the exclusion area boundary is about 2200 feet, or 0.41 mile. The exclusion area distance distribution for other LWR sites is shown in the accompanying table.

<u>Exclusion Area Size (miles)</u>	<u>Percentage of LWR Sites</u>
less than 0.4	40%
0.4-0.6	31%
greater than 0.6	29%

Based on this data, we conclude that the exclusion area size for the CRBR site is about average when compared to other LWR sites.

Q.33. How does the size of the CRBR LPZ compare with that of other LWR sites?

A.33. The LPZ for the CRBR site is 2.5 miles. The LPZ size distribution for other LWR sites is shown below:

<u>LPZ Size (miles)</u>	<u>Percentage of LWR Sites</u>
less than 2	20%
2 - 3	40%
greater than 3	40%

Based on this data, we conclude that the LPZ for the CRBR site is about average when compared to other LWR sites.

Q.34. How does the distance to the nearest population center for the CRBR site compare with that of other LWR sites?

A.34. The distance to the nearest population center for the CRBR site is 7 miles. The population center distance distribution for other LWR sites is shown below:

<u>Pop. Center Dist (miles)</u>	<u>Percentage of LWR Sites</u>
less than 5	12%
5 - 10	27%
greater than 10	61%

Based on this data, we conclude that the population center distance for the CRBR is slightly less than average when compared to other LWR sites.

Q.35. What is the population distribution around the CRBR site?

A.35. The resident population out to 30 miles for the year 1980, and projections for 1990 and 2030, are shown in Table III of the SSR.

Q.36. Has the Staff made any efforts to verify the accuracy or reasonableness of this data.

A.36. Yes. As described in Section II.B of the SSR the Staff obtained an independent estimate of the 1980 population within 50 miles and compared this with the Applicants' value. In addition the Staff examined population growth rates presented by the Applicants with those from independent sources. The Staff also examined population data for 1970 at distances of 5, 10, 20 and 30 miles and using known growth rates from 1970 to 1980, examined the Applicants' 1980 population data. On the bases of these verifications the Staff concludes that the Applicants' population data and projections are reasonable.

Q.37. Mr. Soffer, are there any Commission regulations regarding population density which the Staff utilizes for evaluating nuclear power reactor siting?

A.37. No. 10 C.F.R. Part 100 contains no requirements regarding population density.

Q.38. In the absence of specific Commission requirements on population density, has the Staff established any population density criteria to act as guidance to applicants?

A.38. Yes. Criteria on population density have been published in Regulatory Guide 4.7, Revision 1, "General Site Suitability Criteria for Nuclear Power Stations" (November 1975). As set forth in Section C.3. of Regulatory Guide 4.7, if the population density, including weighted transient population, projected at the time of initial operation of a nuclear power station, exceeds 500 persons per square mile averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the area at that distance), or if the projected population density over the lifetime of the facility exceeds 1000 persons per square mile averaged over any radial distance out to 30 miles, applicants must give special attention and consideration to alternative sites with lower population densities. The population density levels set forth in the Regulatory Guide do not represent upper bound limits of acceptability, but are merely "trip" levels. If the population density "trip" levels are exceeded at the site, the site must be determined to have significant offsetting advantages as compared with available alternate sites of lower density.

Q.39. Mr. Ferrell, has the Staff calculated population density for CRBR?

A.39. Yes. The 0-30 mile population density for the year 1990, as reported in Appendix L of the FES Supplement, is 197 persons per square mile.

Q.40. How do the population density values for the Clinch River site compare with the "trip" levels of Reg. Guide 4.7?

A.40. As noted on page III-2 of the SSR, the Staff concludes that the population density (including weighted transients) for the Clinch River site at projected time of plant startup (year 1990) is well below 500 persons per square mile out to 30 miles. Similarly, the population density at end-of-plant life (year 2030) is well below 1000 persons per square mile out ~~of~~^{to} 30 miles.

Q.41. Does the CRBR population density meet the density criterion ("trip" levels) of Regulatory Guide 4.7?

A.41. Yes.

Q.42. Mr. Soffer, has the Staff compared the population density around the CRBR site with those of other LWR sites?

A.42. Yes. The Staff performed an analysis which lists a first-order prioritization of all power reactor sites with regard to power level and population density. This analysis (attached to this testimony), was presented as part of a Staff paper (SECY 81-25) to the Commission, and divides all LWR reactor sites into 5 groups on the basis of reactor power level and weighted population density. We have also examined the CRBR site in regards to reactor power level and weighted population density using the same methodology as given in the above-referenced SECY paper, and find that the CRBR site falls into the category labeled Group II - Average.

Q.43. How does the 0-30 mile population density for CRBR compare with those of other LWR sites?

A.43. The CRBR site, on the basis of reactor power level and weighted population density, is average when compared to other LWR sites.

Q.44. Mr. Ferrell, has the Staff calculated population densities for each of the alternate sites which were evaluated in Appendix L of the FES Supplement?

A.44. Yes. The 0-30 mile population densities for the year 1990, as reported in Appendix L of the FES Supplement, is presented below:

<u>Reactor</u>	<u>Population Density (people/mile²)</u>
Hanford	66
Hartsville	66
Idaho	36
Murphy Hill	103
Phipps Bend	166
Savannah River	93
Yellow Creek	48

The population densities are lower at each of the alternative sites, compared to the Clinch River site.

Q.45. Mr. Soffer, are any of the alternate sites environmentally preferable to the Clinch River site, on the basis of population density?

A.45. No, since the Staff does not attach any significance to the differences in population density between Clinch River, and each of the alternative sites.

Q.46. Why does the Staff find no significance to the numerical differences in population density between the Clinch River site and each of the alternative sites?

A.46. The Staff uses population density as a relatively crude surrogate for the residual risk associated with accidental releases of radioactivity. The Staff performed an assessment of the residual risk of severe accidents at the Clinch River site in Appendix J of the CRBR FES Supplement. In Appendix J the Staff concluded that the risks to the public were very low for the Clinch River site. Accordingly, any reduction in the already very low residual risk associated with accidental radiation releases which are attributable to population density reductions are not significant.

In addition, as stated in Answer 40, the 0 to 30 population density of the Clinch River site is well below the trip level set forth in Regulatory Guide 4.7. Regulatory Guide 4.7 states that areas with low population densities are to be preferred for the siting of nuclear power reactors. However, the Regulatory Guide does not make any distinction with regard to sites with differing population densities which are below the "trip" levels, and defines "low population densities" to be those which are below the trip levels. Consequently, the Staff concludes that any differences in population density between Clinch River and the alternative sites is insignificant, and that no alternative site is preferable to Clinch River with regard to population density.

Q.47. Mr. Soffer, describe the underground siting concept for nuclear power reactors.

A.47. Underground siting of a nuclear power plant would involve locating the nuclear reactor and possibly other plant equipment beneath the surface of the earth either in a mined rock cavity or by covering the plant with fill earth after construction in an excavated cut.

Q.48. Has the AEC and the NRC evaluated the underground siting concept for nuclear power reactors?

A.48. Yes. Underground siting has been studied in the U.S. for almost 20 years. In July 1973, the AEC issued a report entitled "The Safety of Nuclear Power Reactors and Related Facilities," WASH-1250, which discussed, among other things, underground siting. The report cited the attractiveness of the possibility of "absolute" containment of fission products in the event of an accident, but found that "the AEC has found little technical basis for encouraging the general use of underground siting." The report concluded that:

"the weight of evidence currently suggests that underground siting: a) has necessary features (e.g., penetrations) which tend to offset the presumed containment advantages, b) would add significantly to the costs of nuclear power plants, c) requires extensive and costly R&D for unresolved engineering problems, and d) does not offer a general solution to siting problem in the U.S."

The report also stated a general AEC position that: "although the AEC does not reject the concept of underground siting, it finds little basis for favoring it over surface siting."

In 1975 a study was initiated by the NRC to obtain authoritative answers to generic questions associated with the underground siting concept. This research was carried out by Sandia Laboratories and resulted in the publication in August 1977 of a report entitled "Underground Siting of Nuclear Power Plants: Potential Benefits and Penalties" NUREG-0255. The report concluded that while underground plants had certain inherent safety advantages over surface plants, there were also inherent disadvantages with regard to safety and that overall "the expected benefits of underground siting in terms of improved safety do not appear to offset the penalties."

Studies have also been carried out independently of the AEC and NRC. Probably the most extensive of these is one carried out for the State of California Energy Commission, entitled "Underground Siting of Nuclear Power Reactors: An option for California," which was published in June 1978. The study found that underground siting offered a potential for reducing consequences from core-melt accidents to very low levels, but that other alternatives such as remote siting and controlled release of excessive pressure through simple, engineered filter systems captured some of the benefits of underground siting at less cost. The study recommended that:

"underground siting not be mandated due to a) the uncertainty remaining over costs, construction time and possible licensing concerns; b) the existence of what appear to be moderately effective and less expensive technical alternatives; and c) the opportunity to implement remote siting within California."

Q.49. Would the underground siting concept be applicable to a Liquid Metal Fast Breeder Reactor ("LMFBR") such as CRBR?

A.49. Yes. Underground siting of an LMFBR breeder reactor was suggested in studies as early as 1972 (see, for example, Smernoff, B.J., "Underground Siting of the LMFBR Demonstration Plant: A Serious Alternative," HI-1618/2-P, Hudson Institute, September 12, 1972). The Applicant considered underground siting for the CRBR in Section 2.3.2 of the "Supplemental Alternative Siting Analysis for the LMFBR Demonstration Plant." There appears to be no technical reasons why underground siting would be precluded for an LMFBR such as the CRBR.

Q.50. What are the advantages and disadvantages of underground siting of CRBR?

A.50. The Staff evaluation of underground siting of the CRBR has been discussed in Section 11.9.6 of the FES and updated in the same section of the FES Supplement. Based on the studies of WASH-1250 and NUREG-0255, underground plants have safety advantages over surface plants with regard to:

- 1) protection against aircraft crashes or warfare munitions which could conceivably initiate a reactor accident;

- 2) improved retention of radioactive releases to the atmosphere following a core meltdown, provided that the numerous penetrations to the surface from an underground plant were promptly isolated and maintained in an isolated condition;
- 3) a modest reduction in seismic vulnerability for underground plants.

Underground plants have the following safety disadvantages as compared to surface plants:

- 1) greater operational problems associated with inservice inspection and maintenance which in turn, could lead to decreased equipment reliability and an increased probability of an accident;
- 2) greater potential for flooding;
- 3) greater potential for groundwater contamination following an accident.

Q.51. Is underground siting of the CRBR technologically feasible?

A.51. The above studies have concluded that underground siting of nuclear power plants appears to be technically feasible, although no engineering design presently exists. Certain engineering and

occupational problems have been identified. For example, the success of the underground siting concept depends on the prompt isolation of the penetrations to the surface. Maintenance of seals which isolate the penetrations has been identified as a critical design problem for underground plans. Moreover, prompt isolation of such penetrations could reduce the movement of any operating or maintenance personnel located below ground at the time of the accident, which may present an occupational hazards problem.

The few research reactors that have been located underground are in mined rock caverns having diameters up to about 20 meters. The CRBR would require a cavity of about 75 meters in diameter and hence would require cavities or excavations significantly larger than presently existing ones. Although an excavation of this size is considered feasible, the effort is unprecedented and could lead to unforeseen difficulties.

Based on the NUREG-0255 study, an underground plant is estimated to cost about 20 to 40 percent more than a surface plant.

Q.52. What is the Staff's conclusion regarding underground siting as a siting alternative for the CRBR?

A.52. As presented in Section 11.9.6 of the 1982 FES Supplement, the Staff concludes that underground siting has been sufficiently evaluated and while feasible, the expected benefits in terms of improved

safety do not appear to offset the penalties of construction difficulties, operational problems leading to degraded safety, and additional costs.

Q.53. Mr. Lowenberg, what does the term, "co-location", refer to with regard to nuclear facilities?

A.53. Co-location of nuclear facilities has been considered or postulated for several general applications:

1. Centralized location of large scale fuel cycle facilities such as commercial fuel reprocessing plants and fuel fabrication plants.
2. Centralized location of a number of nuclear power reactors for potential improvements in economy, licensing, socio-economic and emergency response aspects.
3. Centralized location of large scale fuel cycle facilities with nuclear power reactors.

The primary potential benefits from co-location of nuclear facilities are generally ascribed to the co-location of large scale fuel cycle facilities (application 1.), which may have safeguard merits.

Co-location of such facilities would minimize the handling and transportation of large amounts of strategic nuclear materials and possibly improve waste management activities.

Q.54. How could co-location be applied to the CRBR and its related fuel cycle?

A.54. Since the CRBR project involves only one reactor and the related fuel cycle facilities, only application 3, centralized location of large scale fuel cycle facilities with a nuclear power reactor, is relevant for consideration.

Q.55. What would be the advantages and disadvantages of co-location of nuclear power reactors with related fuel cycle facilities?

A.55. The co-location of power reactors with large scale fuel cycle facilities has been considered and found to have essentially as many disadvantages as advantages. The most significant potential advantage of co-location of nuclear facilities comes from the possibility of decreasing the transportation of separated strategic nuclear materials. This may be accomplished in a realistic manner by co-location of large scale fuel reprocessing and fuel fabrication plants. Co-location of a nuclear power reactor with fuel cycle facilities would only decrease the shipment distances of a small amount of fresh and spent fuels. This has never been considered as a very significant factor that should be considered in the cost/benefit evaluation process for a single reactor.

is
The primary disadvantage of co-location of nuclear power reactors with fuel cycle facilities is the need to constrain the size of the fuel cycle facilities to match the fuel capacity of the reactors. *is*
These advantages may be realized only when the fuel requirements

of the reactors approximately matches the fuel cycle facility capabilities.

Q.56. In view of the above considerations do you believe that there is potential merit to co-location of the CRBR with other LMFBR fuel cycle facilities?

A.56. As discussed in Section 11.9.5. of the 1977 FES and Answer 53 above, co-location of nuclear power reactors with large scale fuel cycle facilities is feasible only where the fuel cycle facility capabilities approximately match the fuel requirements of the reactors. The capabilities of the fuel cycle facilities that are proposed for the CRBR are significantly larger than the CRBR fuel needs. There is little apparent merit to co-location of the CRBR with the proposed pilot or developmental LMFBR fuel cycle facilities. Accordingly, the co-location of the CRBR with any of its related fuel cycle facilities would not have a significant effect on site selection considerations.

Prioritization of Sites with Regard to Population Density

1. Introduction

In comparing and evaluating the population around nuclear power reactor sites, the staff has long recognized that the population characteristics of a site, that is, its density and distribution, are a relatively crude measure of the consequences associated with the accidental release of radioactivity. The residual risk from an accident would depend not only upon the population density of the site, but also upon many other factors, such as reactor design, onsite and offsite management and technical support resources, external hazards, liquid pathway considerations, meteorological conditions at the time of the accident, and effectiveness and nature of public protective actions taken. In addition, the risk is not uniform for all members of the population regardless of distance from the site, but would be higher for those persons relatively close to the site, and would generally decrease with distance away from the site.

An analysis has been carried out to obtain a first-order prioritization of sites based upon population density and distribution. The discussion that follows outlines the rationale and methodology used and gives the results of this analysis.

2. Methodology

In carrying out this analysis, the following assumptions and methodology were used:

- (a) All sites where a reactor was either in operation, under construction, or where a construction permit was presently under active review were evaluated. This involved a total of 93 sites.
- (b) The population data used were taken from NUREG-0348, based on the 1970 census. The population data for the Fermi site as reported in NUREG-0348 are in error and were corrected for this analysis by a special computer run of the 1970 census tape.
- (c) Although it is well-known that individuals closer to the reactor are at a higher level of risk, given an accident, than those more remotely located, the precise quantification of the variation of risk with distance is still somewhat uncertain. For the purpose of this analysis, the distance weighting given by the Site Population Factors (SPF), as given in WASH-1235, were used. Further, population beyond 30 miles was neglected, because the consequences at distances within 30 miles were considered to dominate any considerations of overall societal impact, and beyond 30 miles the potential population exposure differences from site to site become less sharp. Preliminary analyses carried out by the staff have indicated that somewhat differing weighting schemes, or the factoring in of population out to 50 miles, does not change the resulting prioritization of sites to a significant degree.
- (d) The power level of the largest reactor at the site was multiplied by the SPF value to account, in a first-order way, for the variation of reactor fission product inventory from site to site. Only one reactor at a site was considered, even where multiple reactors exist or are contemplated,

because the probability of an accident involving more than one reactor simultaneously was considered negligible. Although it can be argued that the population around a 4 reactor site is at a higher level of risk than those around a single reactor site, the prioritization of sites is intended to give a measure of the relative consequences, given that an accident has occurred. The number of reactors at a site presumably effects only the probability of an accident. Also, it could be argued that a multi-reactor site would have some attributes that would reduce risk, compared to a single-reactor site, because of greater management and technical resources that can be applied to reducing either the likelihood or consequences of an accident. Using the above methodology, the reactor power level times the SPF value was calculated and tabulated for each of the 93 sites considered. The results are discussed below.

3. Results

The reactor power level times SPF ($P \times SPF$) was calculated for each of the 93 sites. The resulting values ranged from a high value of 2980 to a low value of 6. The median value is 206; and the median site has a population of less than 100 persons per square mile, which is almost a factor of two less than the population of the average site. The sites are not listed in numerical order, since this would imply a greater degree of precision than is warranted by the uncertainties in the analysis. Also, as pointed out previously, the residual risk at a particular site cannot be measured in terms of consequences alone, since plant design and other factors are important contributors to risk. Therefore, we decided to place each site

into one of five groups or categories. The variation within a given group was selected to be sufficiently small so that each site within that group is considered to have about the same ranking. In selecting the groups we decided to use the median value and factor of the variation about the median to demarcate the "average" group boundaries. The other groups were chosen as indicated below.

<u>Group No.</u>	<u>Title</u>	<u>Range</u>
I	Below Average	PXSPF less than one-half the median value (PXSPF < 100)
II	Average	PXSPF between one-half and twice the median value (PXSPF from 100 to 400)
III	Slightly Above Average	PXSPF between twice and four times the median value (PXSPF from 400 to 800)
IV	Above Average	PXSPF between four and eight times the median (PXSPF from 800 to 1600)
V	Substantially Above Average	PXSPF greater than eight times the median (PXSPF > 1600)

Within each group the sites have been listed in alphabetical order, as shown in the following tables.

Group V - Substantially Above Average

1. Indian Point
2. Limerick
3. Zion

Group IV - Above Average¹

- | | |
|------------------|----------------------|
| 1. Bailly | 5. Seabrook |
| 2. Beaver Valley | 6. Shoreham |
| 3. Fermi | 7. Three Mile Island |
| 4. Millstone | 8. Waterford |

Group III - Slightly Above Average

- | | |
|-----------------|------------------|
| 1. Byron | 11. Peach Bottom |
| 2. Catawba | 12. Perkins |
| 3. Cook | 13. Pilgrim |
| 4. Cherokee | 14. Perry |
| 5. Erie | 15. Salem |
| 6. Forked River | 16. Sequoyah |
| 7. Haddam Neck | 17. Susquehanna |
| 8. Hope Creek | 18. Rancho Seco |
| 9. McGuire | 19. Turkey Point |
| 10. Midland | 20. Zimmer |

Group II - Average

- | | |
|---------------------|--------------------|
| 1. Arkansas | 21. Palisades |
| 2. Bellefonte | 22. Phipps Bend |
| 3. Black Fox | 23. Prairie Island |
| 4. Braidwood | 24. Quad Cities |
| 5. Browns Ferry | 25. River Bend |
| 6. Calvert Cliffs | 26. Robinson |
| 7. Clinton | 27. San Onofre |
| 8. Brunswick | 28. Shearon Harris |
| 9. Davis-Besse | 29. Summer |
| 10. Duane Arnold | 30. Surry |
| 11. Fort Calhoun | 31. St. Lucie |
| 12. Fitzpatrick | 32. Skagit |
| 13. Ginna | 33. Trojan |
| 14. Hartsville | 34. Vogtle |
| 15. LaSalle | 35. Watts Bar |
| 16. Maine Yankee | 36. WPPSS 3/5 |
| 17. Marble Hill | 37. Vermont Yankee |
| 18. Nine Mile Point | 38. Monticello |
| 19. Oconee | 39. Yellow Creek |
| 20. Oyster Creek | |

¹Bailly and Millstone Unit 3 are the only plants in Group IV that are in the early stages of construction.

Group I - Below Average

- | | |
|-------------------|--------------------|
| 1. Allens Creek | 13. Kewaunee |
| 2. Big Rock Point | 14. LaCrosse |
| 3. Callaway | 15. North Anna |
| 4. Comanche Peak | 16. Palo Verde |
| 5. Cooper | 17. Pebble Springs |
| 6. Crystal River | 18. Point Beach |
| 7. Diablo Canyon | 19. South Texas |
| 8. Dresden | 20. WPPSS 2 |
| 9. Farley | 21. WPPSS 1/4 |
| 10. Ft. St. Vrain | 22. Wolf Creek |
| 11. Grand Gulf | 23. Yankee Rowe |
| 12. Hatch | |

CHARLES M. FERRELL

PROFESSIONAL QUALIFICATIONS

SITING ANALYSIS BRANCH

DIVISION OF ENGINEERING

I am a site analyst in the Siting Analysis Branch, Division of Engineering, U.S. Nuclear Regulatory Commission. My present duties in this position include the evaluation of site related environmental safety aspects of nuclear power generating facilities and design basis accident analysis. I graduated from Salem College in West Virginia in 1950 with a B.S. degree in physics and a teaching field in chemistry, biology, and mathematics. Upon graduation, I was drafted, and after completion of armored infantry training at Fort Knox, Kentucky, was assigned as a military physicist to the Radiological Division of the U.S. Army Chemical Corps at Edgewood, Maryland. I spent approximately two years in research involving nuclear weapon thermal radiation, nuclear radiation shielding studies and fallout analysis. I was released from active duty and worked for two years as a civilian physicist in Aerosol Physics (Aerobiology) Research at the U.S. Army Chemical Corps Biological Warfare Laboratory at Fort Detrick, Frederick, Maryland. In 1954, I applied for and was granted an AEC Fellowship in Radiological Physics at Vanderbilt University and the Oak Ridge National Laboratory in Tennessee. An additional year of graduate work in physics was taken at West Virginia University. Night school classes in Nuclear Engineering from the University of Maryland plus short summer courses from MIT in Air Pollution, Heat Transfer, and Nuclear Power Reactor Safety constitute the remainder of my formal education. In April, 1974, I completed a two week course in Pressurized Water Reactor Systems at the Westinghouse Training Center in Monroeville, Pennsylvania. I am a charter member of the Health Physics Society.

I have been a member of the AEC's (now NRC's) Regulatory Staff since 1956. Of these twenty-six years, five years were spent in duties involving the safe industrial and medical use of radioisotopes, in the evaluation of spent reactor fuel shipping casks and the promulgation of reactor fuel shipping regulations. Eight years were served as the Technical Assistant to the Office of Hearing Examiners, U.S. Atomic Energy Commission in which I assisted in approximately 40 hearings on nuclear power reactors, fuel reprocessing plants, and in addition contract appeals hearings on nuclear submarine components and nuclear equipment.

In January, 1969, I transferred to my present position. Since that time I have served as the site analyst on over 50 nuclear power plants, two U.S. Navy nuclear submarine reactors and a proposed nuclear powered crude oil tanker. I served as one of the technical reviewers of Chapter 7, "Assessment of Reactor Safeguards" in Applied Radiation Protection and Control by J.J. Fitzgerald, published under the auspices of the Division of Technical Information United States Atomic Energy Commission. I am one of the co-authors of the report "Demographic Statistics Pertaining to Nuclear Power Reactor Sites" NUREG-0348, and the report "Control of Heavy Loads at Nuclear Power Plants" NUREG-0612, published by the U.S. Nuclear Regulatory Commission.

I have testified in licensing hearings on seven nuclear facilities. These include San Onofre 2/3, Beaver Valley Unit 1, Hutchinson Island (now St. Lucie 1), Yellow Creek 1 and 2, Duane Arnold 1, Trojan Unit 1, and Allens Creek Unit 1.

Educational and Professional Qualifications

Homer Lowenberg
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

My name is Homer Lowenberg. I am the Chief Engineer of the Office of Nuclear Material Safety and Safeguards. I am responsible for refinements of the technological base for improving and updating the licensing process and for the performance of generic and special studies in support of national and international policies and developments in the non-reactor areas of NRC's responsibilities. I am currently responsible for NRC's environmental review of the CRBR fuel cycle. In addition, I handle activities related to the fuel cycle aspects of the GESMO proceeding and LMFBR research; also, I participate in waste management aspects of the TMI-2 clean-up and in technical review of high and low level waste management programs.

I received the degree of Mechanical Engineer from Stevens Institute of Technology with distinction in Chemical Engineering and attended the Executive Development Program of Cornell University Graduate School of Business and Public Administration.

My professional career was initiated with 5 years of plant development and start-up activities for the Hercules Powder Company in smokeless powder, rocket propellants and high explosive operations.

Then I spent 20 years in the architect-engineering field with the Kellogg Corporation which subsequently became Vitro Engineering Co. I was project manager for numerous nuclear facilities including AEC's Purex, Redox and Waste Metal Recovery reprocessing plants at Richland, Washington; the Italian and Swedish Reprocessing facilities; Consolidated Edison's Indian Point Nuclear Power Plant; the Indian Plutonium Laboratory; and a wide variety of nuclear and nonnuclear projects. When Vitro Engineering was sold to Ralph Parsons Co., I was manager of its New York operations.

I was Manager of Central Engineering for Atlantic Richfield Co.'s commercial nuclear activities for 5 years including planning, design and construction of all facilities for fuel material production, fuel assembly and manufacturing, fuel reprocessing and related functions.

I joined the Atomic Energy Commission in 1971 as an assistant director in the regulatory fuels and materials licensing area and continued with NRC upon its creation in 1974. As an assistant director I was responsible for initiating the Reactor-Fuel Cycle Rule (now 10 CFR 51, Tables S-3 and S-4).

I was the program manager and chief commission witness for the GESMO proceeding on widescale mixed oxide use in LWRS; a member of the U.S. delegation to the International Fuel Cycle Evaluation Working Group 4 on Pu reprocessing and recycle and on the TMI-2 Waste Management Task Force.

I am a professional engineer in the states of New York and Pennsylvania.

I was one of the editors of the Reactor Handbook, Volume II published by the AEC on Fuel Reprocessing and have been the program leader on numerous AEC and NRC projects that have been the subject of agency reports.

LEONARD SOFFER
PROFESSIONAL QUALIFICATIONS
SITING ANALYSIS BRANCH
DIVISION OF ENGINEERING
OFFICE OF NUCLEAR REACTOR REGULATION

I am Section Leader of the Site Analysis Section, Siting Analysis Branch, Division of Engineering, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission. My duties in this position include responsibility for the review and evaluation of the population characteristics of nuclear power reactor sites as well as the evaluation of potential hazards posed by nearby man-related activities.

I received a B. S. Degree (with honors) in Physics from the City College of New York in 1952 and attended graduate school at Case Western Reserve University in Cleveland, Ohio.

Before joining the Commission, I was employed for 21 years as a Physicist and Nuclear Engineer with the National Aeronautics and Space Administration (NASA) at the Lewis Research Center in Cleveland, Ohio. In this capacity, I performed analyses on radiation shielding and nuclear safety requirements for nuclear power systems intended for lunar and space applications. I assisted in the radiation shielding design of the NASA Plum Brook reactor, served on an agency-wide study team investigating the radiological safety aspects of using radioisotopes for space power generation, and was section leader of a group responsible for research on radiation shielding and radiological safety concerns. I also monitored contracts and occasionally lectured on radiological physics and shielding to others within NASA.

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I joined the Commission staff in July 1973, and have participated in the detailed review of over 20 nuclear power plants. My responsibilities in this regard have included evaluation of the demographic characteristics and nearby facilities of sites as well as the independent assessment of the likelihood and consequences of various postulated accidents. I have prepared and presented testimony at hearings on the population density and use characteristics of sites as well as the radiological consequences of accidents. In my capacity as Section Leader, Siting Analysis Branch, I am responsible for reviewing the results of similar efforts by others.

Pertinent experience has also included participation in development of a draft standard entitled "Guidelines for Estimating Present and Forecasting Future Population Distributions Surrounding Power Reactor Sites", membership in the NRC Working Group that wrote the "Report of the Siting Policy Task Force" (NUREG-0625), and membership in a Siting Mission to Greece, to assist that Government in the development of demographic criteria for nuclear power plants.

I have also lectured on accident consequence assessment at several courses sponsored by the IAEA, have attended conferences devoted to population projection methodology for small geographic areas and have had discussions with expert demographers on this subject.

I have written about 12 technical papers on various topics related to radiological safety aspects of nuclear reactors. I am a member of the American Nuclear Society and the Population Association of America, which is the professional society of U. S. demographers.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

UNITED STATES DEPARTMENT OF ENERGY
PROJECT MANAGEMENT CORPORATION
TENNESSEE VALLEY AUTHORITY

(Clinch River Breeder Reactor Plant)

}
} Docket No. 50-537
}
}

NRC STAFF TESTIMONY OF PAUL LEECH
GN CONTENTION 7(c)

Q.1. By whom are you employed and what is your position?

A.1. I am employed by the U.S. Nuclear Regulatory Commission ("NRC") as a Senior Project Manager in the Clinch River Breeder Reactor Program Office of the Office of Nuclear Reactor Regulation ("NRR"). A statement of my professional qualifications is attached to this testimony.

Q.2. What is the nature of the responsibilities you have regarding the Clinch River Breeder Reactor Plant ("CRBR")?

A.2. I am responsible for managing the NRC environmental review of the pending application by the Department of Energy ("DOE"), The Project Management Corporation ("PMC"), and the Tennessee Valley Authority ("TVA") for a permit to construct the CRBR. That responsibility has included the preparation of the NRC Staff's ("Staff's") Final Environmental Statement ("FES") (NUREG-0139, 1977) for CRBR, and preparation of the 1982 Supplement to that FES (Supplement No. 1 to NUREG-0139). In addition to directing and

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coordination of the work of various Staff specialists who contributed to these documents, I also participated in the preparation of several documents, including Section 9.2 of the FES and the Supplement and Appendix L of the Supplement, concerning alternative sites.

Q.3. What is the subject matter of your affidavit?

A.3. My affidavit addresses Contention 7(c), which states:

Alternative sites with more favorable environmental and safety features were not analyzed adequately and insufficient weight was given to environmental and safety values in site selection.

- (1) Alternatives which were inadequately analyzed include Hanford Reservation, Idaho Reservation (INEL), Nevada Test Site, the TVA Hartsville and Yellow Creek sites, co-location with an LMFBR fuel reprocessing plant (e.g., the Development Reprocessing Plant), and LMFBR fuel fabricating plant, and underground sites.

Q.4. Did the Applicants identify and assess alternative sites for siting the LMFBR demonstration plant?

A.4. Yes. In Section 9.2.4 and Appendix A of the Applicants' 1975 Environmental Report ("ER"), the Applicants described eleven sites for siting a LMFBR demonstration plant. The eleven sites were screened from 109 potential sites that had been identified by TVA throughout its power service area. The eleven sites identified by TVA were Spring Creek, Blythe Ferry, Caney Creek, Clinch River, *Lee Valley*, Taylor Bend, Buck Hollow, Phipps Bend, Murphy Hill, Johntown (Hartsville) and Rieves Bend. From these eleven alternative sites, the proposed Clinch River site was selected for construction of a LMFBR demonstration plant.

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The Applicants also considered the "hook-on" option, in which turbine-generators at existing conventionally-fired electric generation plants would receive steam from the LMFBR nuclear steam supply system instead of the existing boilers. As discussed in Section 9.2.2 and 9.2.3 of the 1975 ER, the Applicants reviewed all TVA steam power plants which were expected to be operational on a time schedule consistent with the initially planned operation of the LMFBR demonstration plant on the TVA power system. As a result of this review, the Applicants identified the John Sevier and Widows Creek steam plants as suitable for the "hook-on" option.

Thus, three TVA alternative (candidate) sites were initially selected by the Applicants in their 1975 ER - John Sevier and Widows Creek for the hook-on option and Clinch River for a complete plant. The NRC Staff reviewed the Applicants' site selection procedure and identified two additional candidate sites - Murphy Hill and Phipps Bend - which had been selected by TVA as potential sites for commercial nuclear power plants. Those five sites, all located in the eastern part of the TVA power service area, were assessed and compared in Section 9.2 of the 1977 FES.

Following the resumption of NRC's licensing review in September 1981, the Applicants reconsidered the 13 TVA alternative (candidate) sites (two hook-on and eleven original sites, including Clinch River) in the context of NRC's Proposed Rule on Alternative Sites (45 Fed. Reg. 24168, April 9, 1980 ("Proposed Rule")). They

concluded that 12 of the 13 TVA sites identified met the threshold criteria stated in Section VI.2.b. of the Proposed Rule. The one exception was the Rieves Bend site, which would not meet criteria one, four and eight concerning consumptive water use, discharge of effluents and excessive project costs. ER Appendix G, page G-12.

Q.5. Does the Staff agree with Applicants' conclusion that the 13 TVA alternative (candidate) sites, with the exception of Rieves Bend, meet the criteria of Section IV.2.b of the Proposed Rule?

A.5. Yes.

Q.6. Were any TVA sites previously rejected for consideration by Applicants considered in the 1981-82 alternative site evaluation process?

A.6. Yes. The Yellow Creek site, which was not selected as an alternative (candidate) site in the 1975 alternate site evaluation process because of seismic uncertainties, was judged in 1981-82 to meet the Proposed Rule's threshold criteria. Therefore, Yellow Creek was added to the list of 12 TVA alternative (candidate) sites to represent the western part of the TVA power service area. Thus, Applicants identified a total of thirteen alternative TVA sites, including the Clinch River site, for siting the LMFBR demonstration plant.

Q.7. What TVA alternative (candidate) sites were finally selected by Applicants for comparison with the proposed Clinch River site?

A.7. Ten of the thirteen TVA sites discussed above were selected by the Applicants as candidate alternatives to the Clinch River site in Section 4, Appendix G, of the Applicants' ER. Those alternative sites are Spring Creek, Blythe Ferry, Caney Creek, Taylor Bend, Buck Hollow, Phipps Bend, Lee Valley, Murphy Hill, Hartsville and Yellow Creek. Although the Applicants updated the information on all of those sites and compared them to Clinch River, they also noted (in Amendment G, p. G-13) that a smaller number of sites could have been chosen which would fully represent the environmental diversity of the region of interest (the TVA power service area. The Applicants proposed that the Clinch River, Hartsville, Murphy Hill, Phipps Bend and Yellow Creek sites would form such an acceptable set of five candidate sites for Staff review, in accordance with the Proposed Rule.

Q.8. Did the Staff find that the five candidate sites identified by Applicants constitute an appropriate set of alternative sites, consistent with the Proposed Rule?

A.8. Yes. The Staff concluded that the Clinch River, Hartsville, Murphy Hill, Phipps Bend and Yellow Creek sites provide reasonable representation of the diversity of land and water resources within the TVA region of interest, as specified in Section VI.2.a. of NRC's Proposed Rule, with the possible exception of the aquatic ecological characteristics of small river headwaters. Also lacking was a candidate site on the Clinch River other than the proposed site, as called for in Section IV.2.a. of the Proposed Rule. However, the

Staff found that neither of these deficiencies is important because the aquatic impacts of the siting the plant on the headwaters of a small river or at another location on the Clinch River are unlikely to be less than at the proposed site. Further, from its review of the information available on the other six TVA alternative sites identified by the Applicants, the Staff found no reason to believe that any of them would be environmentally preferable to the proposed site. The Staff therefore regards the Clinch River, Hartsville, Murphy Hill, Phipps Bend and Yellow Creek sites as an appropriate slate of alternative (candidate) TVA sites for the LMFBR demonstration plant. The Staff's evaluation of those sites is presented in Section 9.2.5 and Appendix L of the FES Supplement.

Q.9. Did the Staff consider the two TVA sites that would allow use of the "hook-on" option in the 1982 FES Supplement?

A.9. No. The Staff did not consider the two sites because the Applicants rejected the "hook-on" option.

Q.10. Why was the "hook-on" option rejected by the Applicants?

A.10. In Appendix G of the ER, Applicants stated that the potential dollar savings for the hook-on plant (compared to building a complete new plant) no longer exist and, in fact, substantial economic and schedular penalties would result if this option were pursued. Site-specific engineering for the CRBR is at an advanced stage of completion and some of the balance-of-plant (BOP) equipment has already been delivered. Furthermore, the existing BOP

equipment at the John Sevier and Widows Creek fossil fuel-fired plants have aged another six years since the FES was issued, resulting in decreased reliability and remaining life. For these reasons, the hook-on option is no longer considered a viable alternative.

Q.11. Does the Staff agree with the Applicants' reasons for rejecting the hook-on option?

A.11. Yes. As stated in Section 5.2.5 of the FES Supplement, the Staff concluded that the potential dollar savings for the hook-on option no longer exist, substantial schedular and economic penalties would result if this option were pursued, and that the benefits of a stand-alone plant design are significantly greater than a hook-on plant design.

Q.12. What were the Applicant's conclusions regarding the environmental preferability of the TVA alternative sites?

A.12. The Clinch River site was found to be the preferred site in the Applicants' 1977 siting analysis described in ER Section 9.2 and Appendix A. That determination was made from a comparison of the original 13 candidate sites in terms of environmental factors and site engineering considerations (i.e., seismology, foundation conditions, flooding, meteorology, access and transmission facilities).

In their recent reanalysis of the fourteen TVA alternative (candidate) sites, the Applicants again concluded that Clinch River is the preferred site and none of the alternate sites is environmentally preferred to the Clinch River site. That analysis was done in accordance with the first part of the Proposed Rule's sequential two-part analytical test giving primary consideration to hydrology, water quality, aquatic biological resources, terrestrial resources, water and land use, socioeconomics and population. (See ER Appendix G, p. G-15.)

Q.13. Did the Applicants identify alternate sites outside of the TVA power service area for siting the LMFBR demonstration plant?

A.13. Yes. Applicants screened two properties owned by TVA in Kentucky and numerous DOE properties elsewhere in the United States as potential alternative sites for a LMFBR demonstration plant. As indicated in Section 9.2.6 of the 1977 FES, most of the properties were rejected because they were too small (less than 300 acres). Others were rejected for one or more of the following reasons: insufficient cooling water, excessive seismic ground motion, interference with projects under the Division of Military Applications weapons program, relatively high population density, insufficient space, or location in close proximity ($\frac{1}{2}$ mile) to existing DOE facilities.

The Applicants identified the Hanford Reservation, the Idaho National Engineering Laboratory (INEL), and the Savannah River

Plant (SRP) as alternate (candidate) sites for the LMFBR demonstration plant. All three sites are DOE properties.

The Applicants reassessed the 1977 screening process following the resumption of the licensing proceeding, and reviewed all DOE properties which were not considered in the 1977 screening. The Applicants nonetheless concluded that Hanford, INEL, and Savannah River still remain the best DOE alternative (candidate) sites for siting of a LMFBR demonstration plant.

Q.14. Did the Staff independently review the Applicants' identification of Hanford, INEL, and Savannah River as suitable alternative sites outside of the TVA power service area for siting the LMFBR demonstration plant?

A.14. Yes. As discussed in Section 9.2.6 of the 1977 FES the Staff concluded that with the exception of Hanford, INEL and Savannah River, the DOE properties rejected by the Applicants were unsuitable candidates for siting an LMFBR demonstration plant. The Staff's review of Applicants' reanalysis and assessment of DOE properties not previously evaluated does not alter the Staff's conclusion.

Q.15. Was the Nevada Test Site ("NTS") considered by Applicants for siting the LMFBR demonstration plant?

A.15. Yes. The NTS is described and assessed in Section 2.1.1.8 of EF Appendix D. The reasons given by the Applicants for screening out the NTS as a potential site for the LMFBR demonstration plant are

summarized in FES Section 9.2.6. As indicated therein, the NTS was not considered suitable because of the estimated 0.75g design requirement for seismic ground motion, lack of surface water and limited groundwater (use for the demonstration plant would conflict with other uses of Nevada's limited supply) and relatively high transmission line costs. Potential interference with activities associated with research, development, and testing nuclear weapons was also indicated.

Q.16. Did the Staff independently review the desirability of including NTS as an alternative (candidate) site for the LMFBR plant?

A.16. Yes. The Staff concluded that the factors identified by Applicants were good cause to reject the NTS from further consideration.

Q.17. Was the environmental preferability of the three DOE alternative sites evaluated by Applicants for siting of the LMFBR demonstration plant.

A.17. Yes. The Hanford, INEL and SRP sites were assessed by the Applicants in ER Appendices D and E and that assessment has recently been updated by Applicants in ER Appendix F.

Q.18. What were the Applicants' conclusions with respect ^{to} the environmental preferability of the alternate DOE sites?

A.18. The Applicants concluded that "neither Hanford, Savannah River nor INEL is environmentally superior or preferable to the Clinch

River sites and that none of the three alternate sites is a substantially better alternative for satisfying the program and project objectives for this demonstration plant." ER, Appendix F.

In reaching that conclusion the Applicants confirmed that the previous findings in ER Appendix D remain valid, i.e.:

1. Atmospheric dispersion and site isolation factors (minimum exclusion boundary distance, surrounding population density) are somewhat more favorable at Hanford, Savannah River, or INEL than the Clinch River site. However, it must be emphasized that the Clinch River site is still a completely acceptable site for construction of a nuclear facility.
2. A comparison of other siting parameters would not lead one to select the Hanford, Savannah River, or INEL areas as preferable to the Clinch River site.
3. A cooperative arrangement between utilities and DOE for the design, construction, and operation of the LMFBR Demonstration Plant in a utility system is not likely if the LMFBR plant were to be located at either the Hanford, Savannah River, or INEL sites. This would preclude satisfaction of a primary LMFBR Demonstration Plant objective.

Q.19. Did the Staff independently evaluate the environmental preferability of the five TVA sites?

A.19. Yes. The Staff's initial review of those sites was summarized in Section 9.2.5 of the 1977 FES; that assessment has been updated in Section 9.2.5 of the 1982 FES Supplement. It has also been augmented by the Staff's assessment in Appendix L of the Supplement.

Q.20. Did the Staff independently evaluate the environmental preferability of the three DOE sites?

A.20. Yes. The Staff's initial review of those sites was summarized in Section 9.2.6 of the 1977 FES; that assessment has been updated in Section 9.2.6 of the 1982 FES Supplement. It has also been augmented by the Staff's assessment in Appendix L of the Supplement.

Q.21. How did the Staff independently assess the environmental and socioeconomic characteristics of the alternate TVA and DOE (candidate) sites?

A.21. In addition to making their own evaluations of data and analyses provided by the Applicants, the Staff independently assessed the environmental and socioeconomic characteristics of the TVA and DOE alternative sites. In their review, the Staff evaluated the analyses in environmental statements or reports that had been prepared by the Staff for the facilities existing or planned at each candidate site. Other Federal and State agencies were consulted by the Staff to obtain additional information, or to update older information. Finally, Staff members inspected the alternate sites, as necessary.

A discussion of the parameters and characteristics that were considered in the Staff's assessment is provided in the Introduction to Appendix L in the FES Supplement and the Staff's current assessments of those factors for each of the alternative sites are found in Sections 1 and 2 of Appendix L.

Q.22. Is the information regarding the TVA and DOE alternate (candidate) sites sufficient for the Staff to assess whether any of the alternate (candidate) sites would clearly be environmentally preferable to the Clinch River?

A.22. Yes. Available reconnaissance-level information is normally adequate for this purpose (see Part III.2 of the Proposed Rule). In this case, the Applicants provided much more information than is required by supplying various reference materials, which are listed in the Bibliography for Appendix L of the FES Supplement, and including more detailed information in ER Appendices A, D, E, F and G.

Q.23. Are any of the alternative TVA or DOE sites environmentally preferable to the Clinch River site?

A.23. No. The Staff concluded that none of TVA or DOE's alternate sites considered would be environmentally preferable to or substantially better than the proposed Clinch River site for construction and operation of the LMFBR demonstration plant. This conclusion is based upon the Staff's analysis in Appendix L of the FES Supplement and the composite ratings of these sites which are shown in Table L.1.

Q.24. Would there be a delay in completing construction and beginning operation of a LMFBR demonstration plant if an alternative site to the Clinch River site were selected at this time?

A.24. Yes.

Q.25. What would the delay be attributable to?

A.25. As stated in ER Appendix G, at p. G-25, the two basic sources of this delay are:

1. the impact upon existing project arrangements and authorizing legislation, and
2. the impact upon schedules for the preparation of design and licensing information and issuance by NRC of an environmental statement and a site suitability report to reach today's state of the CRBR licensing process.

Q.26. How long would the construction and completion of the LMFBR demonstration plant be delayed if an alternative site were selected instead of the Clinch River site?

A.26. As stated in Section 9.2.6.1 of the FES Supplement, a delay of approximately 36 months is a reasonably optimistic estimate. In arriving at that estimate, the Staff reviewed the basis of the Applicants' estimate that a decision to locate the LMFBR demonstration plant at another site would cause a minimum delay of 33 months and a more probable delay of 43 months starting from the time a decision was made to change sites. The 33-month and 43-month delay schedules are discussed in detail in ER Appendix E and they are summarized in FES Section 9.2.6.1.

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Q.27. Would the selection of an alternative site to the Clinch River site affect the ability of the LMFBR demonstration plant to achieve its objectives under the DOE LMFBR program?

A.27. Yes. Since the Staff's environmental and site suitability reviews of the CRBR application indicate that the proposed Clinch River site would be acceptable for the LMFBR demonstration plant, it is the Staff's position that an avoidable delay resulting from a decision to relocate the plant is not consistent with DOE's timing objective under the LMFBR program - i.e., to construct and operate the demonstration plant as expeditiously as possible. DOE/EIS-0085-FS, May 1982, p. 7.

The Staff believes it is reasonable to assume, as did the Applicants (see ER Appendix G, p. G-34), that TVA would agree to continue in the same role it has with respect to the Clinch River site if the LMFBR demonstration plant were built elsewhere on the TVA power system. However, the Applicants recently contacted the utility groups in the Hanford, INEL and Savannah River Plant areas and found that they are currently unwilling to take on the role of operating the plant at those locations. Thus, it appears that demonstrating the project objectives "in a utility environment" at the DOE alternative sites is not possible at the present time.

Q.28. What are the economic costs attributable to any delays in completing the project because of selecting a different site?

A.28. As stated in Section 9.26 of the FES Supplement, the Staff currently estimates that relocation to another TVA site would result in an increase in the cost of the project of \$39-303 million on a 1982 present worth basis and considerably more on an appropriations basis.

The costs of delay attributed to selection of a new site for an LMFBR plant, on a present-worth basis, are \$94 million for relocation to Hanford, \$259 million for relocation to INEL, and \$61 million for relocation to Savannah River.

Q.29. What was the Staff's conclusion regarding the selection of an alternative site to Clinch River for the LMFBR demonstration plant?

A.29. As stated in Section 9.2.7 of the FES:

The Staff's judgement is that the Applicant's preferred proposal, utilizing the Clinch River site, is reasonable and that no substantially better alternative is available.

PAUL H. LEECHPROFESSIONAL QUALIFICATIONS

I am presently employed by the U. S. Nuclear Regulatory Commission as a Project Manager in the Clinch River Breeder Reactor Program Office of the Office of Nuclear Reactor Regulation. My specific responsibility is to manage the NRC's environmental review of the application to the Commission for a permit to construct the Clinch River Breeder Reactor Plant near Oak Ridge, Tennessee. I had that same responsibility during 1975-1977.

My formal education was obtained at: San Jose (California) State College (pre-engineering, 1939-40); University of Colorado, Boulder, Colorado (B. S. degree in Electrical Engineering, 1943); and Columbia University, New York City (courses in psychology, world trade, literature). Short courses sponsored by various employers included the following subjects: electrical design; management, underground power transmission; ecosystems; nuclear power and environmental assessment; environmental quality and natural resources; PWR Technology.

After graduation from the University of Colorado, my initial experience was predominantly in the application and sale of electrical apparatus, analyzing and reporting technical developments and experience in the electric utility industry, and analysis of the environmental effects of all types of power plants and power transmission and distribution systems.

Beginning in 1945, I was employed for 13 years by the General Electric Company in various assignments related to the design of electrical products and their applications in industry.

Beginning in 1959, I was employed for eleven years as the Western Editor of Electrical World, a technical trade magazine published by McGraw-Hill for the electric utility industry. In this capacity I specialized in the fields of electric power transmission and distribution, system engineering and power generation.

During 1971, I was employed for eight months in the Bechtel Corporation Power and Industrial Division as a senior engineer concerned primarily with environmental effects of nuclear power plants. In September of that year I left Bechtel to accept a position with the Atomic Energy Commission's Office of Regulation (now the Nuclear Regulatory Commission).

I have served the Commission primarily as an environmental project manager for preparation of environmental statements on various applications for construction permits and operating licenses for nuclear power plants, including: Fort Calhoun Station near Omaha, Nebraska; Millstone Power Station at Waterford, Connecticut; Surry Power Station and North Anna Power Station in Virginia; Skagit Nuclear Power Station in Washington; and the Sundesert Nuclear Plant near Blythe, California. I was also the environmental project manager for preparation of the Programmatic Environmental Impact Statement related to decontamination and disposal of radioactive wastes resulting from the March 28, 1979 accident at Three Mile Island Nuclear Station Unit 2. In addition, I served briefly as the licensing project manager for review of the Pebble Springs Nuclear Plant in the State of Oregon.

18-2 1 JUDGE MILLER: Thank you very much, gentlemen;
2 you are excused.

3 (Witnesses excused.)

4 JUDGE MILLER: I guess Intervenors are next
5 in evidence. Do you have witnesses to put on on these
6 issues?

7 MS. FINAMORE: No, we don't.

8 JUDGE MILLER: Does that conclude all the
9 witnesses at this time?

10 MR. EDGAR: Yes, sir.

11 JUDGE MILLER: I commend all of you. Thank
12 you.

13 MS. FINAMORE: I have one additional matter
14 left over from yesterday.

15 As you recall, there was a motion to strike
16 portions of Intervenors' Exhibit 13, based upon Executive
17 Order which we did not receive until this morning. You
18 mentioned that we would be given a chance to respond.

19 JUDGE MILLER: Yes, that's correct.

20 MS. FINAMORE: I'd just like to briefly
21 respond to the two exceptions cited by the Staff as
22 basis for its motion to strike.

23 The first one was Exemption 2-5, Subpart (1),
24 which states that "Actions not having a significant effect
25 on the environment outside the United States, as determined

1 by the Agency, are exempt from the Executive Order."

2 That's on Page 3 of the Executive Order.

3 JUDGE MILLER: That's one in parentheses?

4 MS. FINAMORE: Yes.

5 We submit that that particular exemption does
6 not apply in this particular case since, as far as we are
7 aware, the Commission has never made a determination that
8 the effects of isotopes -- particularly krypton and
9 tritium -- do not have a significant effect on the environ-
10 ment outside the United States.

11 Nor has the Staff at anywhere in its Environ-
12 mental Impact Statement or its testimony made the state-
13 ment that isotopes, such as krypton and tritium --
14 krypton 85 and tritium do not have significant effects
15 on the environment outside the United States.

16 So, therefore, we submit that that exemption
17 does not apply.

18 Secondly, the second exemption cited by the
19 Staff was 2-5, and then little (v) in parenthesis, and
20 I quote: "Export licenses or permits or export approvals
21 and actions relating to nuclear activities, except actions
22 providing to a foreign nation a nuclear production or
23 utilization facility, as defined in the Atomic Energy Act
24 of 1954, as amended, or a nuclear waste management
25 facility."

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1 And as far as that exemption goes, we submit
2 that it applies to exports of nuclear activities, except
3 actions providing to a foreign nation a nuclear production
4 or utilization facility, as defined in the Atomic Energy
5 Act of '54, or a nuclear waste management facility; and
6 that it does not apply to U. S.-produced and operating re-
7 actor.

8 The whole section (v) applies to export acti-
9 vities. We believe the basis for that particular exemption
10 was a case that was decided last year in the U. S. Court
11 of Appeals for the District of Columbia Circuit, entitled
12 Natural Resources Defense Council versus Nuclear Regulatory
13 Commission, 647 F. 2nd 1345.

14 JUDGE MILLER: What's the date of that?

15 MS. FINAMORE: The date is March 30, 1981.

16 JUDGE MILLER: The date of this order is
17 January 4, 1979.

18 MS. FINAMORE: Whoops!

19 JUDGE MILLER: It preceded it.

20 MS. FINAMORE: Excuse me. I'll take that
21 back.

22 JUDGE MILLER: Okay, I understand.

23 MS. FINAMORE: You can see from the case I
24 just cited to you the Court was very clear that the main
25 reason that export activities of exports of nuclear

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1 reactors would not be -- the effect of the -- the solely
2 foreign effects -- foreign environmental effects caused
3 by an export by the United States of a nuclear reactor.

4 The main reason why these impacts should not
5 be considered by the United States in an environmental
6 impact statement is because they would interfere with
7 the ability of a foreign country to choose to import
8 technology from the United States, and that it would inter-
9 fere with the sovereignty of that particular country.

10 But in cases where a particular country did
11 not have a choice as to whether or not to accept this
12 environmental impact, that sovereignty issue would not
13 arise.

14 I submit that in this particular case, foreign
15 countries do not have a choice as to whether or not they
16 will accept the impacts of the krypton and tritium and
17 other isotopes generated by the Clinch River Breeder
18 Reactor.

19 Therefore, no sovereignty issue would arise
20 here, and that, therefore, this exemption does not apply
21 to such a reactor.

22 I'd also point out that the Executive Order
23 requires federal agencies to consider environmental
24 effects upon the global commons which includes the
25 high seas, Antarctica, etc., and that in a situation like

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this when the long-lived isotopes, such as krypton and tritium, will be traveling into the global commons, they should be analyzed in that manner.

And since once they're in the global commons, there's nothing to prevent them from traveling on to other countries, that this should be a particular impact that should be analyzed by the NRC.

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1 MR. SWANSON: If I may respond.

2 JUDGE MILLER: Yes.

3 MR. SWANSON: I think we are probably not in
4 the best position to respond to the second of the two
5 exemptions in greater detail.

6 If the Board needed it, we could brief that,
7 but I really don't think the Board needs to get to that,
8 because I think there's adequate basis to support the
9 Board's earlier decision to strike based on the first
10 exemption, that being that, "Actions not having a
11 significant effect on the environment outside the United
12 States, as determined by the Agency, do not have to
13 come under the provisions of that order."

14 The impacts of this proposed action are
15 analyzed in the Staff's FES. The impacts are considered
16 to be acceptably small within the borders of the United
17 States.

18 There's absolutely no basis for suggesting that
19 they are going to increase outside the United States.

20 We think there's adequate basis for the Board
21 to support its decision based on the existing record.

22 I would like to add one further point, though.
23 I call the Board's attention to the very last section of
24 this Order.

25 It's on Page 4 of the attachment and it's

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1 Section -- I think it's 3-5, but at any rate it's the
2 last one.

3 I would like to read from that: "If a major
4 federal action having effects on the environment of the
5 United States or the global commons requires preparation
6 of an Environmental Impact Statement, and if the action also
7 has effects on the environments of a foreign nation, the
8 Environmental Impact Statement need not be prepared with
9 respect to the effects on the environment of the foreign
10 nation."

11 If the argument in the testimony that was
12 struck is to the effect that the Staff's analysis was
13 inadequate because it failed to address an Environmental
14 Impact Statement, the effects on the foreign country, I
15 think this clause clearly demonstrates that that argument
16 is inappropriate and not supported by this Executive
17 Order.

18 MS. FINAMORE: May I just --

19 JUDGE MILLER: Let's hear from Applicants.

20 MS. FINAMORE: Go ahead.

21 MR. EDGAR: Well, I don't want to belabor the
22 point. First of all, I don't think in terms of the
23 exemption language that NRDC has any basis to read out
24 the term "actions relating to nuclear activities."

25 There's just no answer to that clause and you

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1 didn't hear one.

2 The second thing is that the underlying
3 rationale of the case cited by Counsel was not quite so
4 contorted as it may have sounded.

5 It's simply the central thrust of that case
6 is that Congress didn't intend to extend NEPA so as to
7 cover environmental impacts abroad.

8 We don't feel that there's a legitimate point
9 of dispute here. We think the Board's ruling was correct
10 and should stand.

11 JUDGE MILLER: Do you wish to respond?

12 MS. FINAMORE: I have just a brief response.

13 First of all, to the Staff's point that the
14 environmental impacts within the United States are
15 small and that, therefore, there's no reason for believing
16 that they would be significant outside the United States,
17 I believe the Intervenor's testimony, if admitted, would
18 demonstrate that because these particular isotopes are
19 so long-lived and persistent, that the impacts without the
20 United States would in fact be even greater than within
21 the United States; and that, therefore, it is the Staff's
22 burden to prove that they are not significant.

23 In effect, that's the way the Executive Order
24 reads.

25 Secondly, in terms of the Staff's reference to

9-4 1 Section 3.5, "Multiple Impacts," I think that's a misreading
2 of that particular section.

3 I think the correct reading of that statement
4 is that a separate Environmental Impact Statement need not
5 be prepared on an environmental impact on a foreign nation,
6 if the same action would also have an effect on the
7 environment of the United States; therefore, two separate
8 Environmental Impact Statements need not be prepared, but
9 that one Statement discussing both effects is sufficient.

10 And finally, in terms of Mr. Edgar's statement
11 that Congress did not intend to extend NEPA to activities out
12 side of the United States in the NRDC v. NRC decision that
13 was last year that I cited, the Court cites a number of
14 cases in which activities that are in fact originating
15 within the United States, but have residual impacts outside
16 of the United States were indeed covered by NEPA and should
17 be included within an Environmental Impact Statement, and
18 I can provide those citations to the Board if it wishes.

19 JUDGE MILLER: Well, what were those actions
20 that had an impact or significant effect outside the
21 environment in the case you cited? They were exports,
22 weren't they?

23 MS. FINAMORE: No, no, these are not exports.

24 JUDGE MILLER: What were the cause or the
25 actions having a significant impact or effect in the NRDC

9-5 1 case that you cited? What was being done?

2 MS. FINAMORE: Well, the first one is the
3 preparation of the trans-Alaska pipeline in the State of
4 Alaska and the impacts concerned Canadian citizens.

5 JUDGE MILLER: Well, that was digging a
6 pipeline, constructing a pipeline from Alaska up near
7 Siberia, across Canada and down into the United States;
8 is that the action?

9 MS. FINAMORE: Okay. Well, the --

10 JUDGE MILLER: What was the action being
11 taken? That's all I'm asking about.

12 MS. FINAMORE: They are concerned about the oil
13 spills from Alaska from building the pipeline that would
14 impact Canada.

15 JUDGE MILLER: Oil spills, okay.

16 MS. FINAMORE: So the action was initiated
17 within the United States territorial waters and the
18 impacts were upon Canadian citizens, and I submit that
19 that's a similar situation to the one that we have here.

20 JUDGE MILLER: What is similar to the Clinch
21 River Breeder Reactor? What are they pumping into Canada
22 from Clinch River?

23 MS. FINAMORE: Krypton and tritium.

24 JUDGE MILLER: Pardon me?

25 MS. FINAMORE: Krypton and tritium.

9-6 1 JUDGE MILLER: Well, how? Are they shipping
2 it up?

3 MS. FINAMORE: No, no. See, the action is
4 within the United States, and the action --

5 JUDGE MILLER: The question is what are the
6 actions? The exception is actions not having a
7 significant effect on the environment outside the
8 United States, as determined by the Agency."

9 Setting aside for the moment whether the
10 determination by the Agency is being made by a segment of
11 the Agency, namely the Staff in preparing and presenting
12 an EIS, the question I'm asking now is how are you
13 correlating an action which you cited in the case in
14 which NRDC was a party, which did involve action or
15 conduct of some kind outside in part and having an effect,
16 possibly, upon environment outside the United States,
17 namely Canada?

18 Now I'm trying to correlate the two. What
19 is the connection between that action, whatever the
20 court's decision may have been, and the construction and
21 operation of this particular Clinch River Fast Breeder
22 Reactor?

23 MS. FINAMORE: Okay, I will try to answer what
24 I think your question is. I'm afraid I may mischaracterize
25 your question.

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1 JUDGE MILLER: I'm looking at what is being
2 done --

3 MS. FINAMORE: What is being done, yes.

4 JUDGE MILLER: -- which is an action which
5 could or could not have a significant effect on the
6 environment outside the United States within the meaning
7 of the exception, and I'm asking you if the case which you
8 cited to which NRDC was a party involved from your
9 description wholly different kinds of actions which
10 had a potential effect.

11 MS. FINAMORE: Okay. Let me make one
12 clarification.

13 JUDGE MILLER: Okay.

14 MS. FINAMORE: The case I cited to you is not
15 the one I'm referring to. I'm referring to a case
16 cited in the NRDC vs. NRC case.

17 The NRDC' --

18 JUDGE MILLER: I thought you were citing the
19 NRDC case; am I understanding you right?

20 MS. FINAMORE: Yes. I cited that originally
21 as a basis for the Executive Order. You corrected me on
22 that.

23 That case did involve an export.

24 JUDGE MILLER: Export, okay. That's correct.

25 MS. FINAMORE: And that's the --

9-8 1 JUDGE MILLER: I can see that as being an
2 action. Now, whatever other authority you are referring
3 to, what are the actions or conduct which potentially
4 could have a significant effect on the environment outside
5 the United States?

6 MS. FINAMORE: Okay. The second case I
7 was citing is Wilderness Society v. Morton.

8 JUDGE MILLER: What's the date of that one?

9 MS. FINAMORE: 463 F.2nd, 1261, D.C. Circuit,
10 1972.

11 JUDGE MILLER: 1972, and what were the facts
12 of that case?

13 MS. FINAMORE: Okay. Again, I don't have the
14 case in front of me. It challenges the adequacy of an EIS
15 prepared for the proposed trans-Alaska pipeline.

16 JUDGE MILLER: Oh, yes, the pipeline case.
17 Okay.

18 MS. FINAMORE: Now, again, this is an action
19 that is within the United States, at least partially
20 within the United States --

21 JUDGE MILLER: Yes, but it impacts in part,
22 or potentially so, upon Canada, which is outside the
23 United States.

24 MS. FINAMORE: That's right. Okay.

25 So this is an action by a Federal Agency within

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1 the United States that also has impacts outside of the
2 United States.

3 JUDGE MILLER: That's what I'm trying to get
4 at. What are they?

5 MS. FINAMORE: The impacts outside the United
6 States in that case --

7 JUDGE MILLER: No. In this case.

8 I can see it in the case when something is
9 coming down by pipeline or by boat or whatever from
10 Alaska, which is up near Siberia. I know something about
11 where that is, and I know it has a relationship between
12 Canada and the United States. I can see it now.

13 MS. FINAMORE: I understand your question
14 now.

15 JUDGE MILLER: All right.

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1 JUDGE LINENBERGER: Before you go into this,
2 Ms. Finamore, let me note that you made a prior comment
3 referring to the long half-life of certain isotopes as
4 making it obvious that they will have effects outside the
5 United States.

6 I submit to you that the half-life value
7 in and of itself is not dispositive of this question.

8 MS. FINAMORE: Yes.

9 JUDGE LINENBERGER: So you have --

10 JUDGE MILLER: That's a time function, not a
11 geography function.

12 JUDGE LINENBERGER: And a source of strength
13 function.

14 MS. FINAMORE: Yes. I've been informed that
15 that was an incorrect statement, and I retract it.

16 Let me just briefly explain what the world-
17 wide impacts are that we're talking to.

18 Again, this is --

19 JUDGE MILLER: Well, address yourself to the
20 exemptions there on the 2-5, exemptions in consideration
21 of two in parenthesis and five in parenthesis.

22 By the way, I don't see that the export license
23 and so forth delimits the entire scope of five.

24 That is, one, "Export licenses or permits or
25 export approvals, and actions relating to nuclear activities

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1 exemptions."

2 I fail to see why this is not an action that
3 the NRC is being asked to take in licensing, why that
4 is not an action relating to nuclear activities and clearly
5 within the exemption.

6 I'm troubled -- Take whichever one you
7 want. But it seems to me both of these clearly apply as
8 exemptions to your objection in this proceeding.

9 MS. FINAMORE: Now, to answer your earlier
10 question: What are the particular impacts we're concerned
11 with here?

12 They are the impacts of krypton and tritium
13 from CRBR --

14 JUDGE MILLER: Where --

15 MS. FINAMORE: -- which diffuse throughout
16 the --

17 JUDGE MILLER: I want to look at the environ-
18 ment outside the United States. You tell me what, not
19 where.

20 MS. FINAMORE: I was just about to get to
21 that.

22 JUDGE MILLER: First, you gave me time. Now
23 you've given me what. But you haven't given me where.
24 Where and how.

25 MS. FINAMORE: If I may complete my sentence.

1 JUDGE MILLER: Yes.

2 MS. FINAMORE: This is krypton and tritium
3 from CRBR, which diffuse throughout the Northern
4 Hemisphere and produce worldwide effects, just as world-
5 wide fallout from nuclear weapons --

6 JUDGE MILLER: All right. Let me answer that
7 quickly now.

8 You've had some -- This is a response now,
9 by the way. You're now being cut off in argument.

10 The evidence here is showing that there is
11 some question, at any rate, as to the significance of
12 the effects inside the United States and within, say,
13 the State of Tennessee.

14 That being true, I'm not about to engage in
15 satellite inspection and so on. That argument, I don't
16 think now exists at all.

17 I believe that two definitely covers the
18 exemption.

19 I believe that in addition to that, that this
20 is licensing and the activity under the licensing are
21 actions relating to nuclear activities, and as such,
22 clearly within the exemption.

23 Now, that is true, unless you are going to
24 convince us that we have to delimit that portion by
25 export licenses, which the Board does not agree, if that

1 be your position.

2 If that now be your position, that's a
3 second exemption.

4 MS. FINAMORE: Well, that is our position.

5 JUDGE MILLER: Thank you.

6 The Board will then overrule your objection.

7 We haven't gone into the multiple impacts,
8 because we've not had a chance to do that study. But
9 since we believe that there are two clear grounds of
10 exemption in the operation of this -- January 1979
11 Executive Order, we won't -- we won't rule against you.

12 However, we're not ruling for you either on,
13 the last one. You may be right, I'm not sure. But we
14 haven't had a chance to study, and we don't deem it
15 necessary.

16 MS. FINAMORE: Well, I'd like then to make an
17 offer of proof of Question 15 and Answer 15 as evidence
18 that the impacts of those isotopes outside of the United
19 States will not only be significant, but actually greater
20 than those inside the United States.

21 JUDGE MILLER: Now, your offer of proof
22 normally gives the source of the proof proffered. So if
23 we agree to let you make your -- to fulfill your offer,
24 you'd be able to do it.

25 I know you don't have a witness here, so you

1 can't say, "If you were asked this question, would you
2 give this answer," which is the traditional way of doing
3 it -- but you had better -- if you want an offer of
4 proof to have any meaning in the record, you had better
5 describe some facts that you are offering to prove in
6 some fashion that you're going to get xenon, krypton
7 and ... I don't know ... Coca-Cola ... somewhere affecting
8 in a significant material way the environment outside
9 the United States.

10 That's really what your problem of proof
11 is. So I want you to make an offer that will protect
12 your record.

13 MS. FINAMORE: Yes.

14 JUDGE MILLER: Go ahead.

15 MS. FINAMORE: I'd like to make an offer
16 of proof that would show that the Staff's estimates of
17 the 100-year whole body dose commitment to the U. S.
18 population for carbon 14 is only 42 percent of the world-
19 wide value; that the 100-year whole body dose commitment
20 to the U. S. population for krypton 85 is only 22 percent
21 of the worldwide value; and that the 100-year whole body
22 dose commitment to the U. S. population for hydrogen --
23 tritium is 98 percent of the worldwide value.

24 And, finally, I'd like to make an offer of
25 proof that the worldwide carbon 14 dose integrated over

10-6

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1 the lifetime of the isotope would be about 3000 person-
2 rem, based on Staff's 100-year dose commitment value
3 or 7500 person-rem, using the EPA dose commitment factor
4 found in a document entitled "Health Impacts Assessment
5 of Carbon 14 Emissions from Normal Operations of Uranium
6 Fuel Cycle Facilities," EPA-520/5-80-004, March 1981,
7 Page 22.

8 And, finally, that without considering the
9 additional dose contribution due to I-129 or other errors
10 in Staff estimates, the total whole body environmental
11 dose commitment is approximately 22 to 54 times that
12 presented by Staff in the Final Supplement to the Final
13 Environmental Impact Statement.

14 JUDGE MILLER: Okay. Is that your offer of
15 proof now?

16 MS. FINAMORE: And also that the Staff
17 similarly has failed' to estimate the impact of I-129
18 beyond 100 years throughout the world.

19 JUDGE MILLER: Does that conclude your offer,
20 too?

21 MS. FINAMORE: Yes, it does.

22 JUDGE MILLER: Your offer of proof is over-
23 ruled.

24 You have your record.

25 All right. Is there anything further now

20-7
1 before we recess or adjourn until our December meeting?

2 I think the parties have mutually set forth
3 certain schedules, which appear to be reasonable --

4 MR. EDGAR: Can I check one thing on that?

5 What time would you like to get started on
6 that Monday morning? I'm just looking for --

7 JUDGE MILLER: 8:30. Our normal starting
8 time of 8:30.

9 MR. EDGAR: Okay.

10 - - -

21-1
ged
1 MR. EDGAR: I came over this morning and
2 found myself confused. I came early, but I don't think
3 I knew whether it was 8:00 or 8:30.

4 JUDGE MILLER: Today?

5 MR. EDGAR: Yes.

6 JUDGE MILLER: I said 8:00. I didn't know
7 how long it would take on the last day, so I figured we
8 might need the time.

9 So we actually since Tuesday, our opening
10 day, which was our standard 8:30, we then switched over
11 to 8:00 because we wanted to be sure we accommodated all
12 witnesses and get the four-day week accomplishing what it
13 was supposed to.

14 I guess we can go off the record, can't we?
15 We can keep on talking, but is there any need for the
16 record?

17 MR. SWANSON: I just wanted to indicate the
18 Staff's long-range schedule on ACRS issuances. That
19 could be on or off the record.

20 JUDGE MILLER: Better put it on.

21 MR. SWANSON: Just for the convenience of
22 long-range planning, the Staff's current intention is to
23 issue a single Safety Evaluation Report, which will
24 within it delineate those items which are relevant to
25 LWA-2 matters.

1-2
J
1 The current target date for that is March
2 4, '83.

3 Presuming that the ACRS considers that matter,
4 "that matter" being LWA-2 issues, as a discrete matter,
5 the Staff target for issuing a supplement addressing
6 LWA-2 matters would be May 2nd.

7 I understand there's some uncertainty as to
8 whether or not the ACRS would want to actually have a
9 separate session just on LWA-2 matters.

10 If they did not, then the March 4th date would
11 be the target date for the final Staff document on the
12 LWA-2 matters.

13 I say that just so that people have some
14 current information.

15 JUDGE MILLER: Yes, that's helpful so that we
16 can plan.

17 Does anyone have anything else for the record?

18 (No response.)

19 JUDGE MILLER: Okay. We will close the record
20 at this time. Thank you, Mary, and thank you for coming.

21 (Whereupon, at 3:00 p.m., the hearing was
22 adjourned, to reconvene at 8:30 a.m., Monday, December
23 13, 1982, at the same place.)

24 - - -
25

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

in the matter of: CLINCH RIVER BREEDER REACTOR

Date of Proceeding: November 19, 1982

Docket Number: 50-537

Place of Proceeding: Oak Ridge, Tennessee

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

Mary L. Bagby

Official Reporter (Typed)

Mary L. Bagby

Official Reporter (Signature)