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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 BEFORE THE ATOMIC SAFETY LICENSING BOARD PANEL

4 _____

5 In the Matter of:) Docket No.

6) 52-008-ESP

7 DOMINION NUCLEAR NORTH ANNA LLC) ASLBP No.

8) 04-822-02-ESP

9 _____)

10

11 Louisa County Public

12 Meeting Room

13 Executive Board Room

14 1 Woolfolk Avenue

15 Louisa, Virginia

16

17 Wednesday, April 25, 2007

18 9:00 a.m.

19 BEFORE:

20 ALEX S. KARLIN, Chair,

21 Administrative Judge

22 THOMAS ELLEMAN, Administrative Judge

23 RICHARD F. COLE, Administrative Judge

24

25

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C-O-N-T-E-N-T-S

TOPIC		PAGE
3.	Tritium	295
	Questions	387
4.	Radiologica Releases and Doses from Normal Operations	456
	Questions	557

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

2 9:00 a.m.

3 JUDGE KARLIN: Good morning. Please be

4 seated. Good morning, we can go on the record. Good

5 morning, this is Alex Karlin. We're now reconvening

6 the Atomic Safety Licensing Board Evidentiary Hearing

7 in the matter of Dominion Nuclear North Anna LLC's

8 application for an early site permit with regard to

9 the site in -- near Lake Anna. Today, we're going to

10 proceed with what we call Topic Number 3, I guess, the

11 tritium issues and as with yesterday, we will just

12 simply swear in the witnesses starting with the staff

13 witnesses and then ask them to give a brief

14 presentation and then ask some questions. And then

15 we'll turn to the Applicant's panel of witnesses and

16 kind of do the same thing.

17 Do either of my colleagues have anything

18 they want to add at this point?

19 JUDGE COLE: Not at this point.

20 JUDGE ELLEMAN: Nothing.

21 JUDGE KARLIN: Okay, good. Do the parties

22 have anything they need to point out or add at this

23 point?

24 MS. POOLE: No, thank you, your Honor.

25 JUDGE KARLIN: Okay, Mr. Lewis?

1 MR. LEWIS: No.

2 JUDGE KARLIN: Okay. Good, good, well
3 then let's proceed. Welcome and let me ask you
4 gentlemen to rise and raise your right hand, please.
5 I know some of you have already testified but we're
6 going to do this again since it's new day here.

7 (Witnesses sworn.)

8 JUDGE KARLIN: Thank you, please be
9 seated. Tritium, please proceed with your
10 presentation.

11 MR. STOETZEL: Good morning, my name is
12 Greg Stoetzel. I'm the principal Safety and Health
13 Engineer with the Pacific Northwest National
14 Laboratory. My professional background is in the area
15 of health physics. My expertise related to the
16 preparation of the Environmental Impact Statement was
17 radiological health impacts and uranium fuel cycle
18 impacts. Mr. Jean-Claude Dehmel is a Senior Health
19 Physicist with the Nuclear Regulatory Commission and
20 worked on the radiological impact portions of the
21 Safety Evaluation Report. His area of expertise is
22 in radiological effluence and implementation of 10 CFR
23 Part 20 and 10 CFR Part 50, Appendix I, Design
24 Objectives for Radiological Effluence.

25 Slide 2; I'm going to provide an overview

1 of several topics related to tritium. I'm going to
2 discuss briefly tritium properties, sources of tritium
3 in the environment around the operating and proposed
4 units.
5 JUDGE KARLIN: May I ask you to pause for
6 a moment. I should have said this yesterday and I
7 didn't, sorry to interrupt your presentation. But Mr.
8 Lewis, I know that you probably are not able to see
9 any of these presentations on the view graphs. You
10 have the slides, so if the counsel wanted to move over
11 to the --
12 MR. LEWIS: I can actually see it there.
13 JUDGE KARLIN: You can see it? Okay,
14 sorry for the inconvenience on that. Please proceed,
15 Mr. Stoetzel.
16 MR. STOETZEL: We're also going to discuss
17 release mechanisms into the environment, tritium
18 release source term, exposure pathways for tritium and
19 then finally concentrations of tritium in the
20 environment around the current operating units.
21 Tritium is a naturally occurring
22 radioactive form of hydrogen that is found in the
23 atmosphere with cosmic rays collide with air
24 molecules. As a result, tritium is found in trace --
25 very small or trace amounts in the surface and

1 groundwaters throughout the world. It is also a by-
2 product of electricity by nuclear power plants which
3 is obviously, the topic of our discussion today.
4 It is a low energy beta emitter. It has a
5 physical half life of approximately 12 and a half
6 years. It can be found in an elemental form and also
7 it can bond with oxygen to form tritiated water. The
8 tritiated water is chemically identical to normal
9 water and it cannot be filtered from the water.
10 Tritium presents an internal hazard to humans. It is
11 found primarily in liquid and enters the body when
12 people eat or drink food -- drink water containing
13 tritium and it can also be absorbed through the skin
14 and be inhaled as a gas.
15 Once it enters the body, it disperses
16 quickly and is uniformly distributed through the soft
17 tissues. It has a half life of approximately 10 days
18 in the body. Slide 4, sources of tritium. Tritium is
19 produced in reactors by neutron reactions with light
20 elements in the reactor coolant. For example, boric
21 acid in the coolant of a pressurized water reactor and
22 it is also produced by fission in the fuel.
23 Most of the tritium produced in the fuel
24 remains there. A small percentage, less than one
25 percent, can leak into the coolant through defects in

1 the fuel cladding. It can also diffuse through the
2 cladding. For boiling water reactors, small amounts
3 of tritium are found in the primary coolant via
4 activation of the deuterium and also there can be
5 leakage through fuel clad defects.
6 For a typical thousand megawatt electric
7 wind water reactor, typical releases to the
8 environment are approximately an average of like 45
9 curies per year for liquid effluence and approximately
10 on the order of 20 curies per year for gaseous
11 effluence. Slide 5, for pressurized water reactors
12 the major contributor to tritium is in the primary
13 coolant is due to neutron interaction with the boron
14 in the coolant. For a thousand megawatt electric
15 pressurized water reactor, typical treating releases
16 into the environment for a liquid effluence are
17 approximately 800 curies per year and for gaseous
18 effluence are on the order of 35 curies per year.
19 For heavy water reactors, tritium is
20 formed by neutron activation, deuterium in the
21 coolant. For the ACR-700 design the estimated, which
22 operates as one of the seven designs presented for the
23 PPE and that has a power level of approximately 1462
24 megawatt electric. The tritium released to the
25 environment are estimated at 3100 curies per year in

1 liquid and 3500 curies per year for the gaseous
2 effluence.
3 For the gas cooled reactors, specifically
4 for the GGT-MHR gas cooled design, tritium releases
5 are estimated at less than 35 curies per year for the
6 liquid effluence and approximately 75 curies per year
7 for the gaseous effluence.
8 JUDGE KARLIN: A question or two; on the
9 heavy water reactors we have the liquid 3100 curies
10 per year. Is that the source of the perimeter
11 envelope term, I guess it was of 3100 curies per year
12 that was used originally in the --
13 MR. STOETZEL: It was used originally in
14 the first --
15 JUDGE KARLIN: -- Safety Analysis Report,
16 I think.
17 MR. STOETZEL: Originally, and the in
18 Revision 9 of the application that was reduced to --
19 JUDGE KARLIN: 850.
20 MR. STOETZEL: -- 850 which we'll discuss
21 later.
22 JUDGE KARLIN: Okay, yeah, we'll discuss
23 that later. So that was the -- was that the source of
24 the 3100?
25 MR. STOETZEL: Yes, yes, it was.

1 JUDGE KARLIN: Okay, the heavy water
2 reactor. And when you say gas coolant reactors, you
3 know, the pebble bed reactor, for example, we're
4 talking about 16 reactors that would be put on the
5 site if -- authorized to be put on the site. How do
6 you convert that to the 35 curies per year liquid.
7 That's -- you had 1140. So that would be the total
8 four of them, the total or multiply it by 16?
9 MR. STOETZEL: The data on the slide is
10 for the GTMHR, not the --
11 JUDGE KARLIN: Oh, I see GTMHR, yeah.
12 MR. STOETZEL: Yeah, and this if for the
13 status --
14 JUDGE KARLIN: And how many would that be,
15 I guess --
16 MR. STOETZEL: Four modules make up a
17 unit.
18 JUDGE KARLIN: So that's eight reactors.
19 MR. STOETZEL: There would be eight for
20 two units on the site.
21 JUDGE KARLIN: But the 35 curies per year
22 is the total for all four --
23 MR. STOETZEL: Four modules.
24 JUDGE KARLIN: -- reactors within a unit.
25 Okay.

1 MR. STOETZEL: Right.

2 JUDGE KARLIN: Yeah, that's what I
3 thought. What's the big difference between a boiling
4 water reactor and the prior Slide 4, 45 curies per
5 year and the pressurized water reactor, 800 curies per
6 year?

7 MR. STOETZEL: The pressurized water
8 reactor has the boron -- boric acid in the coolant
9 that is activated and is the source of the tritium.

10 JUDGE KARLIN: Oh, okay. Ah, all right.
11 Thank you.

12 MR. STOETZEL: Slide 6 discuss release
13 mechanisms. As part of routine releases or normal
14 releases from the Units 1 and 2, tritium is released
15 to the environment through the liquid waste management
16 system and the gaseous waste management system. For
17 reactors, Units 1 and 2 the reactor coolant let-down
18 with tritium will enter the boron recovery system and
19 be processed by the liquid waste system and is
20 subsequently released to the discharge canal which
21 flows into the waste heat treatment facility and
22 finally into Lake Anna.

23 All the gaseous waste gases are collected
24 diluted, filtered through charcoal filters and
25 monitored for flow rate, pressure, temperature and

1 particulate and gaseous activities prior to being
2 released through process vents. As I mentioned
3 earlier, tritium cannot be filtered from the releases.
4 JUDGE KARLIN: On this one if I
5 understand, the existing Units 1 and 2, they are what
6 kind of unit, BWR, PWR?
7 MR. STOETZEL: They're Pressurized Water
8 Reactors.
9 JUDGE KARLIN: PWRs, okay, so on your
10 prior Slide Number 5 we would be talking about 800
11 curies per year for 100 megawatt electric.
12 MR. STOETZEL: That's correct.
13 JUDGE KARLIN: Thousand, thousand
14 megawatt, okay.
15 MR. STOETZEL: Thousand, yeah, thousand
16 megawatt, okay.
17 JUDGE KARLIN: And the release mechanism
18 slide, Slide 6, normal releases, the tritium would be
19 released into the discharge canal. Is that what
20 you're saying, from Units 1 and 2?
21 MR. STOETZEL: That's correct.
22 JUDGE KARLIN: Is it released out of a
23 pipe, a discharge pipe, like you would for a refinery
24 or a factory or is it just leached through the ground
25 or how is it discharged? How is it released into the

1 discharge canal?

2 MR. DEHMEL: There is actually a discharge

3 structure.

4 JUDGE KARLIN: Oh, is there?

5 MR. DEHMEL: Yeah, and the discharge

6 point, essentially is an accumulation of different

7 types of water discharges from the plant, one of which

8 is the discharge from the radioactive waste processing

9 system and those releases do not occur continually.

10 They are batch releases. So you could have operation

11 -- periods of time where the plant is operating on no

12 radioactive discharges at all and there would be other

13 times where the waste is processed and then a

14 discharge is initiated and a discharge lasts for the

15 duration of the time it takes to pump a tank down.

16 JUDGE KARLIN: Oh, okay, so it's pumping

17 out of a tank or something like that and that's

18 discharged.

19 MR. DEHMEL: Yes.

20 JUDGE KARLIN: Okay, thanks.

21 JUDGE COLE: So when you're sampling, you

22 have to see what's happening at the plant, too,

23 otherwise you get some very different readings.

24 MR. DEHMEL: Do you mean sampling the tank

25 or sampling the discharge canal?

1 JUDGE COLE: Whatever you're sampling.

2 MR. DEHMEL: Well, you're sampling from

3 the tank. The way the radiological effluent technical

4 specification work is that if you have a so-called

5 batch release, a tank containing, you know, 50, 60,000

6 gallons of water, you have to --

7 JUDGE COLE: You make a batch for the

8 discharge.

9 MR. DEHMEL: -- you have to actually

10 sample the tank, determine what the radionuclide

11 concentrations are and then based on that, establish

12 the conditions under which that discharge would be

13 acceptable, meaning that you have to establish a

14 release rate and confirm that the radiation monitor

15 that is going to monitor the discharge has an alarm

16 set point such that if it were to exceed the pre-

17 established level, it would terminate the release.

18 JUDGE COLE: Thank you.

19 MR. STOETZEL: For abnormal releases, a

20 review of past, this is where tritium was released to

21 the environment on monitor was, as we discussed

22 yesterday a little bit about the September 6th report

23 by the Commission on nuclear radioactive releases,

24 release lessons learned task force report. None of

25 the instances that were in that report involved the

1 North Anna Power Station.

2 The staff did not consider leakage to the

3 groundwater as a pathway in the Environmental Impact

4 Statement because of proposed Safety Permit Condition

5 Number 4 which would require the Applicant to submit

6 a rad waste system design with features to preclude

7 accidental releases of radionulcides into potential

8 liquid pathway.

9 In addition, the PPE approach does not

10 provide the details of a -- of the rad waste system

11 design so there wasn't information available to

12 predict the release pass.

13 JUDGE KARLIN: May I ask, on the normal

14 releases you've discussed and indicated in the prior

15 slides if I understand that correctly, from BWR, PWR

16 sources of tritium and you've given some values as to

17 the amount of tritium per year, here you have normal

18 releases and abnormal releases. And when you were

19 discussing the amount that comes out of a PWR/BWR, is

20 that the normal releases?

21 MR. STOETZEL: Normal releases.

22 JUDGE KARLIN: Okay, so those are the

23 normal intentional, as it were, monitored releases

24 that would be expected. You have a tank. You're

25 going to sample it, you're going to pump it out and

1 discharge it. And the abnormal releases we were
2 talking yesterday, you'll remember, are those the kind
3 that are discussed in the September 2006 report on
4 tritium by the Agency, lessons learned?
5 MR. DEHMEL: Yes, your Honor, that's
6 correct. The normal releases reflect, you know,
7 spills and leaks, component failure, operator error
8 and those are -- it's not that they're ignored in the
9 operational context. They are -- they have to be
10 addressed and they are appended to the annual effluent
11 release report and there was -- at the end of the year
12 when the licensee sends an annual effluent release
13 report, there are two major sections to the report.
14 One is, you know, here is the information describing
15 our effluent releases with normal operation under
16 control and monitored as is required by 10 CFR
17 5034(a), and the tech spec.
18 And then in addition to that, we've had
19 the following upsets and those are described with
20 respect to the amount of radioactivity, potential
21 impact, who might be the dose receptor on site or off
22 site, and make a determination at that point as to
23 whether or not additional mitigated measures have to
24 be initiated on site and whether or not the extent or
25 the scope of magnitude of the offsite radiological

1 environmental monitoring program needs to be updated.
2 So this information is submitted to the staff every
3 year and then it's reviewed.
4 JUDGE KARLIN: Now, but I thought within
5 the abnormal -- perhaps this is within the abnormal
6 release category. Is there a distinction between what
7 we were talking about yesterday, accidental releases
8 which are more in the nature of sudden events which
9 are recognized and can be dealt with as opposed to
10 slow insidious, you know, leaks which may not be
11 recognized or does abnormal releases cover both?
12 MR. DEHMEL: No, it does cover both.
13 There's a subtle distinction here, your Honor. One is
14 that let's assume that a tank ruptures. So all of a
15 sudden you have essentially 50,000 gallons of well
16 water spilling into the building and possibly out of
17 the building into the ground.
18 JUDGE KARLIN: Right.
19 MR. DEHMEL: So you might say, well, this
20 is an accident. Well, it's considered as an abnormal
21 release. What happens is the depending on the
22 immediate corrective actions they may have taken,
23 let's assume that the bulk of the radioactivity has
24 been collected and removed in the form of scooping out
25 the contaminated soil. But what's left in the soil

1 are residues from this decontamination effort. Now,
2 this residue, or let's assume that we are not able to
3 capture all of the fluid because it moves through the
4 soil very quickly, is going to be kind of a slow
5 protracted release. It's going to reflect the KD of
6 the specific radionuclide, the movement of groundwater
7 from that point of release wherever the dose receptor
8 is.
9 So then what you have over time you have
10 a plume moving with different front. The first one
11 will be tritium, the next one will be cobalt, and so
12 on, cesium and so on, whatever was present in the tank
13 and that would be moving out. So that's why the long
14 term, the protracted aspect of the accidental release,
15 to use your words, is that they would be addressed as
16 part of the onsite monitoring program that might be
17 implemented in response to that accident and secondly,
18 there is another component that would be essentially
19 the staff -- the Applicant or the licensee would have
20 to look at is whether or not in light of that release,
21 there's a need for any changes to the routine effluent
22 monitoring program.
23 JUDGE KARLIN: Right.
24 MR. DEHMEL: So these have to be looked
25 at.

1 JUDGE KARLIN: Okay. That's very helpful
2 but I think you're probably going into a little more
3 detail than any of us is looking for. I was trying to
4 understand accidental releases, abnormal releases. As
5 I saw it yesterday, there are accidental releases
6 which are relatively sudden events, the breaking of a
7 tank, the over-pumping by a pump that might cause a
8 spill that is quick to be recognized and reasonably
9 quick to be remediated versus pipelines, underground
10 lines that might leak slowly and insidiously over
11 years without being recognized absent any kind of
12 monitoring in that area.
13 MR. DEHMEL: In the context of the way the
14 guidance is set up, especially if you look at Reg
15 Guide 121, defines releases and abnormal releases.
16 The two events you're describing are considered as
17 abnormal releases.
18 JUDGE KARLIN: Okay.
19 MR. DEHMEL: There's no distinction
20 between the sudden rupture of a tank versus a
21 protracted leak from a pipe, you know, leaking at two
22 or three gallons per minute forever. There's no
23 distinction and the issue of accident, you know, for
24 us, the staff, means something that it's a severe
25 accident. It's kind of Chapter 15 analysis and these

1 are not Chapter 15 analysis or accident scenarios.
2 They're not severe accidents.
3 JUDGE KARLIN: Right.
4 MR. DEHMEL: So we -- in the context of
5 routine effluence, you know, we shy away from the term
6 accident.
7 JUDGE KARLIN: I see, okay.
8 MR. DEHMEL: Because they don't involve
9 the core. They don't involve primary coolant in the
10 context that you would address this in Chapter 15
11 accident analysis.
12 JUDGE KARLIN: Okay. Thank you.
13 MR. STOETZEL: Slide 7, tritium release
14 source term, the PPE gaseous and liquid effluents were
15 derived by the Applicant using the most conservative
16 release values for each radionuclide for the reactor
17 design where the information was available. The PPE
18 source term was derived from the ABWR, the ESBWR and
19 the AP 1000 and the ACR 700. For the other three
20 reactor designs, the Applicant provided a qualitative
21 discussion on why the source terms would be bounded by
22 the four I mentioned earlier, and the -- for the
23 tritium source term, the ACR 700 is the most -- has
24 the most limiting gaseous and liquid source -- release
25 source term.

1 The liquid effluent source term for
2 tritium was revised as I mentioned earlier from 3100
3 curies per year per unit to 850 curies per year per
4 unit in revision 9 of the Applicant's Environmental
5 Report. This value was reduced to insure that the
6 concentrations, the tritium concentrations in Lake
7 Anna would not exceed the EPA drinking water standard
8 of 20,000 picocuries per liter which is found in 40
9 CFR Part 141.
10 The revised tritium release rate per unit
11 would result in an estimated tritium concentration in
12 Lake Anna of approximately 9400 picocuries per liter,
13 based on operation of the current Units 1 and 2 and
14 the proposed Units 3 and 4. This is below the EPA
15 drinking water standards also. The gaseous effluent
16 release source term was -- for tritium was 3500 curies
17 per year.
18 In addition staff evaluated an additional
19 216 curies per year of tritium released to the
20 atmosphere from the Unit 3 wet cooling towers. Staff
21 calculated this value by multiplying the average
22 annual tritium concentration in Lake Anna which I
23 mentioned earlier was approximately 9400 picocuries
24 per liter times the evaporation rate for the Unit 3
25 cooling tower.

1 Exposure pathways for the existing Units
2 1 and 2, tritium is released as part of the liquid rad
3 waste to the discharge canal into the waste treatment
4 facility and into Lake Anna. The two primary liquid
5 exposure pathways to the public were ingestion in
6 drinking water, and ingestion of aquatic food. Doses
7 from exposure to shoreline sediment and exposure to
8 boating -- exposure to water through boating, swimming
9 or other recreational activities would not be a
10 significant exposure pathway.
11 For the gaseous exposure pathway to the
12 public are inhalation of airborne tritium and
13 ingestion of vegetables and meat contaminated with
14 tritium. Doses from exposure -- from external
15 exposure of the airborne plume and external exposure
16 to contaminated ground would not be significant for
17 tritium. For the proposed units, the exposure
18 pathways would be the same as I just mentioned for the
19 existing units with the one exception that I discussed
20 in the previous slide of the tritium release from the
21 Unit 3 wet cooling tower.
22 JUDGE COLE: That's pre unit megawatt
23 produced or how because these plants that are being
24 proposed are much larger than the existing plants?
25 MR. STOETZEL: You're referring to the

1 release from the cooling towers?

2 JUDGE COLE: Well, all the tritium

3 released. You said it would be the same as the

4 existing plants, but the existing plants are much

5 smaller than the proposed plants and isn't there some

6 factor there that per megawatt electric produced

7 you're going to have a certain amount of tritium

8 produced? These proposed plants are twice as large.

9 MR. STOETZEL: We used the PPE source term

10 release for the -- for our evaluation which would be

11 the 850 curies per year per unit. So we valued that

12 total for release.

13 JUDGE COLE: Okay.

14 MR. STOETZEL: So, yeah. Slide 9 is

15 information on tritium concentrations in the North

16 Power -- North Anna Power Station environment as a

17 result of units -- operation of Unit 1 and 2 was

18 obtained from the annual environmental operating

19 reports of the licensee. These reports provide

20 results of their radiological environmental monitoring

21 program. As part of their program, Dominion routinely

22 samples for tritium in surface waters of the waste

23 treatment facility and also at a location

24 approximately 5.8 miles down stream of the plant in

25 the North Anna River and at one upstream location,

1 approximately 13 miles upstream.

2 One onsite well is also samples quarterly

3 and analyzed for tritium. A review of the annual

4 environmental operating reports for the years 2000

5 through 2005 do not show any tritium concentrations

6 that exceeded the EPA drinking water standards. At

7 the waste treatment facility the average over that

8 time period was approximately 3050 picocuries per

9 liter and the average for the North Anna River was

10 approximately 2960 picocuries per liter. And the

11 well, the onsite well, was in the upstream location

12 just basically control location were at background

13 levels.

14 JUDGE COLE: And what was background?

15 MR. STOETZEL: In their annual reports

16 they provide a -- their values. For example, we saw

17 yesterday some of the data like a less than value,

18 less than 100 or less than 400 whatever the detection

19 level was for that particular analysis. It would

20 depend on the background for the day they were

21 counting it and also the count times.

22 JUDGE COLE: So the detection level, so

23 that might have been 400, anything under 400.

24 MR. DEHMEL: More detail analysis, for

25 example, there's an NCRP report that talks about that.

1 On an average in the US the thought is that on surface
2 -- in surface water, the background tritium
3 concentration from all sources other than nuclear
4 power plant is on the order of about three to 15
5 picocurie per liter and in groundwater it's on the
6 order of about 150 picocurie per liter, but that's
7 highly, highly variable. It depends on local
8 hydrology, the residence time of the water, whether
9 there are any water exchanges and so on, mixing. So
10 it's highly variable but typically, it's less than 200
11 picocurie per liter.
12 JUDGE COLE: Thank you, that's all.
13 JUDGE KARLIN: A question on that,
14 upstream onsite well background, what were the values?
15 Do you have -- I mean, you say it's background.
16 MR. STOETZEL: Yes, they were less than --
17 it's less than ours.
18 JUDGE COLE: What is background here? You
19 said it's background. What is background? You just
20 said it was 150 on average in the United States.
21 That's good to know. What's background here? We
22 don't know.
23 MR. DEHMEL: Well, your Honor, I saw a
24 number of 160, less than 160, less than 170 picocuries
25 per liter.

1 JUDGE KARLIN: So you think that's
2 background in the groundwater here?
3 MR. DEHMEL: Yes, I have no problem with
4 that value --
5 JUDGE KARLIN: Okay.
6 MR. DEHMEL: -- as characterizing the
7 background. No, I don't have a problem with that.
8 JUDGE KARLIN: Okay. Well, monitoring the
9 surface water for tritium, waste heat treatment
10 facility, second lagoon, now the waste heat treatment
11 facility is composed of three lagoons? Is it three
12 lagoons or two?
13 MR. STOETZEL: Three.
14 JUDGE KARLIN: Three, and they are what --
15 how many thousand acres of lake water or apparent lake
16 water, 4,000, 5,000?
17 MR. STOETZEL: I don't have that number.
18 JUDGE KARLIN: Okay, and the second waste
19 -- the second lagoon, where is that monitoring point
20 on the second lagoon. How far -- how many miles is it
21 from the discharge point?
22 MR. STOETZEL: I don't know the mileage.
23 JUDGE KARLIN: Okay, and the concentration
24 at that monitoring point is 3,050, approximately,
25 picocuries per liter average.

1 MR. STOETZEL: Average, over that six-year
2 reporting period.
3 JUDGE KARLIN: Okay, is there monitoring -
4 - all right, there's a discharge point into the -- if
5 we go back to page 6, the discharge canal. Is there
6 any monitoring done at the discharge canal for the
7 tritium?
8 MR. STOETZEL: Not at the end point, where
9 it goes into the first pond?
10 JUDGE KARLIN: Why?
11 MR. STOETZEL: No, not as part of the
12 radiological environmental monitoring program.
13 JUDGE KARLIN: Okay, but is there any at
14 all that you know of that the Applicant has done or
15 that the NRC has done? This monitoring of the amount
16 of tritium that is coming out of the discharge point?
17 MR. DEHMEL: This is reported -- your
18 Honor, this is reported yearly in the annual effluent
19 release report where they actually identify the number
20 of curies that were discharged.
21 JUDGE KARLIN: Right, and we have in the
22 report the total number of curies discharged.
23 MR. DEHMEL: Discharged for every year.
24 JUDGE KARLIN: What I was looking for is
25 a concentration during a discharge.

1 MR. DEHMEL: That's described in the --
2 it's part of the radiological effluent technical
3 specification which actually considered the
4 distribution and the concentration of radionuclides in
5 a tank and it makes -- and the licensee makes a
6 determination as to whether or not that discharge can
7 proceed in the context of complying with 10 CFR Part
8 20 Appendix B concentrations as well as complying with
9 Appendix, 10 CFR 50 Appendix I, dose objectives.
10 That determination is made at that time.
11 Based on that, knowing the dilution that's taking
12 place in the discharge canal, the rate of discharge
13 from the pump using the pump from the tank is
14 regulated such that once the discharge water hits the
15 discharge canal and hits the waste station treatment
16 facility it does not exceed any of those regulations.
17 So you're asking -- we don't have, per se, I don't
18 have a table that says well, for Tank 15-5, you know,
19 here are the radionuclide concentrations and here are
20 the ones -- we don't have this information.
21 JUDGE KARLIN: Let me just ask, I mean, in
22 an NPDS permit for a petroleum refinery you have an
23 outflow one, two, three at the outflow and the outflow
24 is a pipe and you have a monitoring device at the
25 pipe. And the EPA puts a standard and says, "You

1 shall not discharge more than 30 milligrams per liter
2 of total suspended solids. You shall not discharge
3 more than one part per million of benzene. You shall
4 not discharge", and they monitor that at the pipe, at
5 the outflow. What you're saying is no one is
6 monitoring the tritium that's going out the pipe.
7 MR. DEHMEL: It's monitored before that
8 tank.
9 JUDGE KARLIN: Okay, it's in the tank.
10 MR. DEHMEL: It's monitored at the point
11 of -- in other words, it's monitored at the point
12 where there's a maximum control over the discharge.
13 So just imagine a tank, a discharge pump, a valve and
14 a radiation monitor.
15 JUDGE KARLIN: Okay.
16 MR. DEHMEL: Then you set the pump at a
17 specific flow rate. On the radiation monitor, you set
18 up the alarm set point based on those regulatory
19 limits.
20 JUDGE KARLIN: And the regulatory limits
21 you're referring to are --
22 MR. DEHMEL: The concentration and doses
23 from Appendix I.
24 JUDGE KARLIN: The concentration and doses
25 at receptors?

1 MR. DEHMEL: At a receptor, right.

2 JUDGE KARLIN: At some human being 15

3 miles away. What I'm trying to get at is how much is

4 the concentration when it's going out the pipe and

5 whether anybody -- now, you're saying -- I guess what

6 I understand is you're not measuring at the pipe but

7 someone does measure at the tank.

8 MR. DEHMEL: It's measured at the tank

9 before it hits the discharge -- before it hits the

10 discharge structure --

11 JUDGE KARLIN: Okay, right.

12 MR. DEHMEL: -- and goes into the lake,

13 into the canal and --

14 JUDGE KARLIN: So what's the picocurie

15 concentration in the tank?

16 MR. DEHMEL: I don't have that answer. I

17 do not know.

18 JUDGE KARLIN: There's some range. Have

19 you looked at that? Is it sometimes over 20,000

20 picocuries per liter?

21 MR. DEHMEL: Oh, yes, it could be.

22 JUDGE KARLIN: So it's over the EPA

23 drinking water standard what's being discharged out

24 the pipe?

25 MR. DEHMEL: Yeah, it could be. Now we

1 have to be careful. What goes out the tank could be
2 higher, but then taking into account in-plant dilution
3 plus the dilution from the canal, you'd comply with
4 the standard.
5 JUDGE KARLIN: Those that would occur on
6 the ground within the nuclear power plant and they
7 would apply to discharges that would occur that are
8 not regulated by an NPDS program, but I was just
9 curious what the reportable quantity for tritium is.
10 MR. DEHMEL: I do not have that answer.
11 JUDGE KARLIN: Okay.
12 JUDGE COLE: For the purposes of NPDES
13 permit requirements, what's the discharge point for
14 North Anna? Is it the end of the waste treatment
15 facility, WHTF facility?
16 MR. DEHMEL: I don't have that answer. I
17 do not know.
18 MR. STOETZEL: I don't know either.
19 JUDGE COLE: I think they said yesterday,
20 you're right, that it was Gate 3 or Dike 3.
21 MR. STOETZEL: Gate 3 or Dike 3.
22 JUDGE COLE: If that's the reliance point
23 for permit requirements, why aren't we measuring
24 tritium there?
25 MS. POOLE: Your Honors?

1 JUDGE KARLIN: Yes.

2 MS. POOLE: Mr. Vail can answer that

3 question.

4 JUDGE COLE: The question of where the --

5 MS. POOLE: The location of the -- if you

6 would mind --

7 JUDGE COLE: Mr. Vail, you've been sworn,

8 if you could answer that. Yes. I think we're --

9 we're -- I think it's the third dike or gate or

10 something like that.

11 MR. VAIL: Yeah, Dr. Cole was right in

12 saying that it was at Dike 3, that that's the specific

13 target of the compliance point for the NPDES permit.

14 JUDGE KARLIN: And does the NPDES permit

15 limit tritium?

16 MR. VAIL: No, no.

17 JUDGE KARLIN: I think no, because the NRC

18 does not -- I mean, the EPA dos not regulate the

19 radiological discharges.

20 MR. VAIL: Correct.

21 JUDGE KARLIN: Right. Okay, thank you.

22 MS. POOLE: Thank you.

23 JUDGE ELLEMAN: A question related to the

24 prior discussion. You refer to online monitors that

25 have set points and they trigger when you exceed

1 required levels within the material that's being
2 discharged. As we know, tritium isn't easy to detect
3 and you don't likely detect tritium within the online
4 monitors, do you?
5 MR. DEHMEL: No, that's correct. There
6 are in the distributions and concentrations you would
7 expect to see in a tank, they are radionuclides that
8 we call hard to detect and easy to detect. And you
9 know and hard to detect would be tritium is one of
10 them, carbon 14 and others. But what is typically
11 done is a surrogate radionuclide is used, an easy to
12 detect radionuclide. So in this case, the alarm set
13 point would reflect an easy to detect radionuclide for
14 example a gamma emitter, such as cesium 137 or cobalt
15 60.
16 And then you would set the alarm set
17 point, taking into account that the surrogate
18 radionuclide, cesium 137, essentially is a telltale
19 indicator for the contribution of all others and then
20 the alarm set point is adjusted accordingly to account
21 for the contribution of all the other radionuclides
22 that you cannot detect.
23 JUDGE ELLEMAN: Okay, I think I follow
24 that. The ratios of your different isotopes within
25 the material that's being released may not be constant

1 all the time. The tritium concentration may be a
2 little higher or a lower than the cesium
3 concentration, whatever. And so your trace isotope
4 has got to be geared to one or the other, does it not?
5 MR. DEHMEL: That's correct.
6 JUDGE ELLEMAN: And you probably wouldn't
7 gear it to tritium, would you?
8 MR. DEHMEL: No, you would not because you
9 would have no indication, you would have no control
10 over the release. Remember that under Appendix I
11 requirements and the way the tech spec are structured,
12 is that and we're talking -- we're not talking about
13 normal releases now, right? We're talking about
14 planned managed releases, so they have to be under,
15 you know, this has to be controlled and monitored.
16 So you would not use tritium essentially
17 as a telltale indicator. So you would use cesium 137,
18 but regarding your point is that the tank would be
19 sampled.
20 JUDGE ELLEMAN: Yes.
21 MR. DEHMEL: And then you would make an
22 analysis and then -- and make a determination as to
23 what is the distribution of the radionuclide.
24 JUDGE ELLEMAN: Ah, okay, that's where I
25 was heading. So you will take a batch sample out of

1 that material. You would use liquid scintillation
2 counting or --
3 MR. DEHMEL: Or whatever.
4 JUDGE ELLEMAN: -- whatever you want to
5 use to look for the tritium and you'll know thereby
6 the ratio of the tritium with the other estimates.
7 MR. DEHMEL: Yeah, and also please note
8 that with, you know, a long operating history
9 ultimately you can develop a library of radionuclide
10 concentration distribution as a function of the origin
11 of the liquid waste.
12 JUDGE ELLEMAN: Yes, yes.
13 MR. DEHMEL: So all these plants have
14 essentially kind of effective library and say, well,
15 if this is going to be waste from equipment drain,
16 they would know what a typical distribution of
17 radionuclides are, knowing, you know, the operating
18 status of the plant and so on. So you can see there
19 would be different types of waste, you know, one
20 during routine operation and another one during
21 maintenance because you're doing -- it's a different
22 plant -- different type of plant evolution.
23 So they have plenty of experience in that
24 context and this is really what I just described is
25 kind of a matter of routine operation, routine

1 consideration in this program.

2 MR. STOETZEL: We have one more slide.

3 For the post units, the PPE tritium liquid effluent

4 release value per unit was 850 curies per year. The

5 estimated tritium concentration in Lake Anna from

6 operation of the two proposed units is approximately

7 6400 picocuries per liter. This is based on the past

8 relationship of tritium liquid effluent releases and

9 the tritium concentrations in Lake Anna from operation

10 of Units 1 and 2. And that concludes our

11 presentation.

12 JUDGE ELLEMAN: And that 850, that is

13 Dominion commitment, is it not, in the PPE?

14 MR. STOETZEL: That is their PPE value for

15 tritium, yes.

16 JUDGE ELLEMAN: That they have committed

17 to for new units.

18 MR. STOETZEL: If they came in with an

19 application that was more than 850 curies per year for

20 tritium in the liquid effluents, then we would have to

21 re-evaluate that.

22 JUDGE KARLIN: Let me just ask on this

23 slide, you estimated Lake Anna tritium concentration

24 if they limit it to 840 picocuries per liter is 6400

25 picocuries -- I'm sorry it's 850 curies per year then

1 it would be 6400 picocuries per liter concentration in
2 the lake.
3 MR. STOETZEL: Correct.
4 JUDGE KARLIN: I'm looking -- that's
5 inconsistent, it seems to me with page 5.59 of that
6 FEIS which seems to say, if I'm reading it right, 9400
7 picocuries per liter.
8 MR. STOETZEL: The 9400 picocuries per
9 liter is -- adds the 3,000, roughly 3,000 picocuries
10 per liter from the current operating Units 1 and 2.
11 So that the total in the lake, that's the total for
12 the lake with operation involving --
13 JUDGE KARLIN: Ah, so this -- I was under
14 the impression the 6400 was the total of tritium
15 concentration.
16 MR. STOETZEL: That's just considering
17 Units 3 and 4.
18 JUDGE KARLIN: Now, in addition -- so the
19 total will be 9400 picocuries.
20 MR. STOETZEL: Estimated.
21 JUDGE KARLIN: Estimated, estimated,
22 right. Okay that confused me.
23 JUDGE ELLEMAN: So really, that 6400 is
24 estimated Lake Anna tritium concentration is the
25 contribution of the new units.

1 MR. STOETZEL: That's correct.

2 JUDGE KARLIN: Why are the new units -- I
3 mean, if the existing units have established a level
4 of 3100 picocuries per liter concentration, why are
5 the new units being -- adding twice that much?

6 MR. STOETZEL: There's the --

7 JUDGE KARLIN: Are they bigger? Do you
8 have more -- are they better or worse than they were
9 before?

10 MR. STOETZEL: Well, the two existing
11 units -- the two existing units release an average of
12 I think it's roughly 800 curies per year for the two
13 Units 1 and 2 combined.

14 JUDGE KARLIN: Okay.

15 MR. STOETZEL: So the PPE value is 850
16 curies per year per unit. So it would be multiplied
17 times three.

18 JUDGE KARLIN: All right, but the
19 question, I guess is still the same; why are the new
20 Units 3 and 4 emitting twice as much as the old units?

21 MR. DEHMEL: Your Honor, because those are
22 PPE value. These are assumed values. It does not --
23 remember, all these analysis are done as an exercise
24 without knowing the kind of right of way system
25 they're going to have, without knowing whether or not

1 they're going to be releasing, you know, lower amounts
2 of waste water than the current unit and so on. So
3 these are essentially, we -- it's kind of an analysis
4 based on this PPE concept with no underlying
5 information as to the kind of technology that may be
6 used and the kind of operating practices that would
7 result in lesser or greater amounts of water discharge
8 from those tanks.
9 JUDGE KARLIN: Yeah, I guess what I
10 understand is the PPE values cover a range of
11 different, you know, structures and types of reactors
12 and within that range it might be higher, it might
13 actually be lower than the existing units but within
14 the range of the PPE values, it could be higher and so
15 you have to be conservative and assume it's going to
16 be higher.
17 MR. DEHMEL: Yes, that's true. You know,
18 in defining the PPE, the approach that you want to
19 use, at least an applicant would say, "Well, I give
20 myself enough buffer, enough protection, so to speak
21 in developing this envelope so that you can choose
22 different types of reactor technology and hoping that
23 that -- the technology you ultimately select, you
24 know, will fall underneath this envelope that is the
25 PPE concept.

1 JUDGE KARLIN: Well, let me ask one more
2 question on the slides and then I'll turn it over to
3 Dr. Elleman and Dr. Cole, but does the PPE of 850
4 curies per year, does that mean that the applicant has
5 abandoned the ACR 700 option because that would be
6 3500 -- 3100 curies per liter?
7 MR. STOETZEL: Yes, if they came in with
8 the ACR 700 we would have to re-evaluate the doses.
9 JUDGE COLE: They would have to be
10 prepared to justify it.
11 MR. STOETZEL: Right.
12 JUDGE KARLIN: Well, could they build an
13 ACR 700 and meet the 850 curies per year? I mean,
14 doesn't that just knock the ACR 700 out of the
15 envelope? It can't meet the envelope?
16 MR. DEHMEL: Well, if they were to build -
17 - if they were to select the ACR 700 in the
18 application it would have to explain that in the ESP
19 application, you know initially they proposed, you
20 know, over 3,000 curies. It was reduced down to 850
21 and then, you know, what kind of technology, what kind
22 of operating procedures, would be in place so that
23 they would comply with 850. So this would have to be
24 presented and the applicant would have to make a case
25 for it in the COL application.

1 JUDGE KARLIN: All right, I was just
2 wondering, now the PPE values, the staff applies some
3 criterion to whether or not those are reasonable, it's
4 a reasonableness standard, not unreasonable?
5 MR. STOETZEL: We didn't do -- we looked
6 at -- most of the values in the PPE were from several
7 reactor designs; ESBWR, the AP 1000 and the ACR 700.
8 You know, we looked at the general design criteria of
9 the source, the predicted looked normal effluent
10 source terms for those designs and looked at that PPE
11 and did kind of a general comparison to see if they
12 were in that range and they were. So we didn't do,
13 you know, an exhaustive study of all seven designs and
14 recreate their table but --
15 JUDGE KARLIN: Yeah, but it sounds like on
16 the one hand you could say PPE values. The Applicant
17 could make up whatever PPE values they wanted, put
18 them down on the table and if the time comes when they
19 want to build their plant, they can't meet them,
20 that's the Applicant's problem. NRC has not rhyme or
21 reason to even look at the PPE values. But as I
22 understand it, that's not true and the way we approach
23 it, the way you all approach it was you have to look
24 at the PPE values to see if they're at least
25 reasonable for the range of plants that are being

1 proposed. And it sounds like this one borders on the
2 not reasonable because you already know this
3 particular type of unit nets 3100 -- ACR 700 emits
4 3100 curies per liter and yet they come in with an 850
5 curies per year, I'm sorry. And so is 850 a
6 reasonable PPE value for an ACR 700?
7 MR. DEHMEL: Well, the Applicant would
8 have to make a determination as to whether or not
9 first, is it realistic to achieve 850.
10 JUDGE KARLIN: Well, I want the NRC to
11 make a determination now. I think it has to make a
12 determination now whether that's a reasonable PPE
13 value to proceed on. If it's not, one option would be
14 to simply say, "Thank you but that reactor is not
15 within the -- is not reasonably within the envelope.
16 We're just not -- it's not going to be included in the
17 range that you can build unless you come in with a
18 different application for a different ESP".
19 MR. DEHMEL: No, we're not evaluating the
20 application in that context. The only thing that we
21 do with the PPE value for the source term, for example
22 in this case, they refer to the ABWR, the AP 1000 and
23 the ESBWR. For the ABWR and the AP 1000, there are
24 already approved design control documents that have
25 been approved by the NRC. So we were able to look at

1 what is contained in the design control document and
2 confirm that what they are proposing essentially falls
3 within this part of the envelope.
4 JUDGE KARLIN: Right.
5 MR. DEHMEL: Okay, and for the ESBWR, it's
6 a work in progress, so we're looking at a draft
7 submittal so far, you know, that GE had submitted to
8 the NRC. For the ACR 700, they initially assigned a
9 value of 3100 curies per year and after the staff's
10 evaluation, we flagged it to the Applicant and said
11 that, "Be aware that if you go with 3100, there is
12 going to be a potential -- it's going to potentially
13 result in Lake Anna and waste treatment facility
14 exceeding the EPA drinking water standard of 20,000
15 picocurie per liter".
16 So as a result of this discussion, they
17 reduced it to 850. We did not -- no, we don't pass
18 judgment as to whether or not this should be 800, 825
19 or 725. We didn't.
20 JUDGE KARLIN: Okay.
21 MR. DEHMEL: The point is -- our concern
22 was if you decide this technology and you're releasing
23 tritium at a specific rate, would you or would you not
24 exceed the EPA drinking water standard? And the
25 answer is --

1 JUDGE KARLIN: Well, why do you care?

2 MR. DEHMEL: Why do I care?

3 JUDGE KARLIN: Is the lake going to be

4 used for drinking water?

5 MR. DEHMEL: It could be. I don't know.

6 JUDGE KARLIN: I mean, why is that such a

7 red line?

8 MR. DEHMEL: Because we --

9 JUDGE KARLIN: Nobody is drinking that

10 water.

11 MR. DEHMEL: Because we specified in the

12 technical specification, if water is used for

13 drinking, then the licensee has to comply with the EPA

14 drinking water standard. So we already flagged this

15 in our technical specifications.

16 JUDGE KARLIN: Okay, but I'm just trying

17 to understand why the drinking water standard is such

18 a hot button one way or the other. It might be less,

19 it might be more. If it's the drinking water, I can

20 understand. EPA would regulate drinking water and

21 prohibit it from being above that standard. But I

22 don't think -- I don't understand that it's drinking

23 water.

24 Well, let me back up, 3100 if we use the

25 ACR 700 and it was 3100 curies per year, then you're

1 thinking that it would -- could exceed 20,000
2 picocuries per liter in the lake.
3 MR. DEHMEL: That's correct.
4 JUDGE KARLIN: Is that right? That was
5 the source of the concern. Okay. Thank you. Dr.
6 Elleman?
7 JUDGE ELLEMAN: Okay, sure. Good morning.
8 The reason we wanted to explore tritium in this
9 session today and I think probably this is apparent to
10 you, is that as acknowledged, tritium is the one
11 isotope that approaches some established limit and I
12 think in various places it says they have measured
13 tritium concentrations as high as 47 percent of the
14 EPA allowed drinking water standard. And I believe
15 that factor is probably what contributed to lowering
16 the desired objective for tritium for the PPE to take
17 it down to a lower value so that they could --
18 Dominion could be assured of staying below what is the
19 drinking water limit.
20 The other reason we were interested in
21 tritium is it seems the one isotope you're measuring
22 consistently outside of the plant and so it seemed
23 appropriate to us to take a look at how it gets there,
24 what the chances of it getting higher might be and
25 what we can say about tritium.

1 We asked you as part of our questions what
2 the sources of tritium were and you responded to that
3 and you've reviewed today what some of the dominant
4 sources are. Is there a single dominant source for a
5 boiling water reactor and a single dominant source for
6 a pressurized water reactor and if so, what is the
7 dominant source that gets out?
8 MR. DEHMEL: Dominant source in terms of
9 activity, waste stream?
10 JUDGE ELLEMAN: Yeah, in terms of activity
11 that's going to end up getting out of the plant.
12 Where is it coming from?
13 MR. DEHMEL: Well, I mean, if you were to
14 look for tritium, possibly some of the highest
15 concentrations are found in spent fuel pool.
16 JUDGE ELLEMAN: Okay.
17 MR. DEHMEL: That much I can say for sure.
18 Beyond that, beyond the --
19 JUDGE ELLEMAN: Okay, if that's the
20 highest concentration -- that's interesting. If the
21 highest concentrations are in the spent fuel pool,
22 that almost certainly is getting out of small leaks in
23 the fuel cladding from the stored fuel in the pool, is
24 it not?
25 MR. DEHMEL: Yes, with one clarification

1 I said one of the highest. I didn't say it was the
2 highest, one of the highest, one clarification.
3 JUDGE ELLEMAN: Okay, so leaking from the
4 fuel must be a fairly significant source then. Is
5 that -- do you think that's correct?
6 MR. STOETZEL: You're talking about
7 boiling water reactors or --
8 JUDGE ELLEMAN: Well, I guess that
9 question was with respect to both of them. The fuel
10 is pretty similar for both boiling water and --
11 MR. DEHMEL: Well, it's a combination of
12 when the fuel is transferred from the reactor vessel
13 to the spent fuel pool, there are two water bodies.
14 I mean, there's water contained in the reactor vessel
15 and then you have water stored in the spent fuel pool.
16 JUDGE ELLEMAN: Uh-huh.
17 MR. DEHMEL: And once you transfer the
18 fuel, or attempt to transfer the fuel from the reactor
19 vessel to the spent fuel pool, the water levels are
20 essentially -- the water essentially becomes
21 commingled, so you have essentially radioactivity from
22 the primary coolant that essentially is intermixed
23 with the spent fuel pool. So you have a contribution
24 of tritium from the primary coolant which becomes
25 mixed with the water that was in the spent fuel pool.

1 But this is kind of a broad generalization because it
2 depends on operating practices and how spent fuel is
3 transferred. This is a question that perhaps should
4 be best addressed to the Applicant.
5 JUDGE ELLEMAN: Okay, now the water that
6 gets into the primary coolant, what is the dominant
7 production source in your view for the tritium in that
8 part of the system?
9 MR. DEHMEL: For PWR it's first
10 activation, neutron activation of boron, and then the
11 next one, much lower would be the neutron activation
12 of lithium which is used for ph control. And the
13 third one is the naturally occurring deuterium, heavy
14 water, in tap water.
15 JUDGE ELLEMAN: Transportation, uh-huh.
16 MR. DEHMEL: Any water.
17 JUDGE ELLEMAN: And so that would imply
18 you do not believe that coming out of leaks in the
19 fuel would be a significant source of tritium in the
20 primary.
21 MR. DEHMEL: No, no, there is a small,
22 whatever number that keeps on popping up depending
23 which textbook you look at. It's typically one
24 percent of what you have in spent fuel makes it out of
25 the spent fuel, you know, out of the fuel matrix

1 itself, out to the cladding and into the water, so
2 unless you have some dramatic failed fuel.
3 JUDGE ELLEMAN: All right, and the one
4 percent gets out how? Is it getting our by diffusion
5 through the cladding or is it getting out through
6 leaks in the fuel assembly?
7 MR. DEHMEL: It's both, it's both, yeah,
8 defects in the cladding and long-term diffusion
9 through the metal, because it's the lightest element
10 so it diffuses somewhat, you know, readily.
11 JUDGE ELLEMAN: Okay, and for BWRs, what
12 do you think is the major source for BWRs?
13 MR. DEHMEL: The deuterium, the naturally
14 occurring deuterium in water.
15 JUDGE ELLEMAN: Okay, not lithium
16 impurities?
17 MR. DEHMEL: No, typically, they don't use
18 lithium. I'm not saying -- again, generally speaking,
19 it depends on the kind of plant chemistry that is
20 used. Generally, lithium is not used.
21 JUDGE ELLEMAN: Okay, and so the tritium
22 you've eluded to in the spent fuel pool, that is
23 getting out not by escaping from the fuel, but it's
24 getting out from a commixing of primary coolant with
25 the water in the spent fuel pool at the time of

1 transfer of the assemblies in the spent fuel pool?

2 MR. DEHMEL: Yeah, because this water

3 essentially you might say is pumped back and forth and

4 becomes commingled and co-mixed but again, this kind

5 of broad generalization depends on, you know, what the

6 refueling practices are. Plants have different

7 operational requirements, different types of systems,

8 so I just -- that's as far as I'm willing to go on

9 this one.

10 JUDGE ELLEMAN: Okay, let's talk a little

11 bit now about how it gets out of the plant and I'm

12 particularly interested in sources escaping from the

13 plant that are unmonitored sources that are not

14 detected. How does it get out the plant, out of the

15 system? How is it going to get out into the

16 environment?

17 MR. DEHMEL: Well, several ways. For

18 example, you might have sumps in the low portions of

19 the building. There may be concrete on-line sumps.

20 And so water may, over the years, permeate through

21 concrete joints, concrete may crack and thereby

22 providing some sort of pathway.

23 Another one would be --

24 JUDGE ELLEMAN: You lost me on that one.

25 Let's not leave that one. It's got to get out of the

1 primary system somehow and get into the rest of the
2 plant. If it's in where the pumps are, it's got to be
3 coming out of leaking pump seals or --
4 MR. DEHMEL: I'm sorry.
5 JUDGE ELLEMAN: Or something like that,
6 doesn't it?
7 MR. DEHMEL: Yes, that's correct. There
8 are leaks and spills -- that's right.
9 JUDGE ELLEMAN: Things like that.
10 MR. DEHMEL: That's correct. That's what
11 happens during the plant operation and there are
12 specifications for certain types of -- certain parts
13 of the system as far as leakage rates. So there are
14 specifications on that. But ultimately as part of the
15 kind of leakage rates, as well as plant evolution, if
16 you open a system, they're going to conduct some
17 maintenance. It's going to change a valve or do
18 something, then occasionally there are some minor
19 spills and leaks that takes place on the controlled
20 conditions within the physical boundary of the plant.
21 So some of this water, ultimately, makes
22 it into a flow drain and flow drain goes possibly into
23 a sump or it goes into a sump and then it's pumped
24 into a tank. So what happens is that there is some
25 water in these sumps. Some of the water may migrate

1 because of cracks and joints and things like that out
2 of that structure into the ground.
3 JUDGE ELLEMAN: Do you think all of that
4 water ends up in the waste processing system or does
5 a fair amount of it bypass the waste bypassing system?
6 MR. DEHMEL: If it leaks out of the pipe,
7 corrosion pipe break or out of the sump, at that point
8 it's no longer a controlled release. Essentially,
9 it's out in the part of the plant where you no longer
10 have physical control in managing, controlling,
11 monitoring that release. So it's underneath the
12 structure, it's underneath the foundation. It's
13 outside a loading dock or whatever.
14 JUDGE ELLEMAN: It's gone.
15 MR. DEHMEL: It's gone. You have no
16 control over it at that point.
17 JUDGE ELLEMAN: Now you mentioned almost
18 all the tritiated water, but I've read that some part
19 of it is organic tritium. And of course, organic
20 tritium is going to behave entirely differently. Is
21 that a problem? Is that something that an operator is
22 going to worry about?
23 MR. DEHMEL: Yes, I'm aware of that, Your
24 Honor, but my thought is that it's professional
25 opinion at this point is that organically-bounded

1 tritium I don't think is an issue with nuclear power
2 plants because of great care in making sure that you
3 don't have any organic contaminants in primary coolant
4 in a kind of material, the kind of in this case makeup
5 water. You want to make sure that the makeup water is
6 absolutely clean and pure.
7 So I don't think organically bound tritium
8 in the context of the primary coolant is perhaps
9 unlikely. It depends on the waste processing site,
10 something happens there and so for example, you may
11 say well, I have detergent waste from the laundry
12 room, from the shower, the personal use to
13 decontaminate themselves. That's detergent waste and
14 there you may have some of that which -- but that's
15 treated separately as an effluent source and there are
16 specific treatment methods for that purpose alone.
17 JUDGE ELLEMAN: Yes.
18 MR. DEHMEL: But those are very, very
19 small contributions of detergent waste, so to speak,
20 as opposed to the kind of waste, liquid waste that
21 releases from the large processing tanks.
22 JUDGE ELLEMAN: Okay. All right. The --
23 again continuing, explain how it's going to get out of
24 the system. Let's say the licensee builds a BWR. If
25 there's a condenser leak, then water from the primary

1 gets out into the head exchanger and it's released
2 into the atmosphere. So that's a release path for
3 tritium into the environment, wouldn't it be?
4 MR. DEHMEL: That's correct.
5 JUDGE ELLEMAN: And that's not uncommon,
6 is it, to have condenser leaks?
7 MR. DEHMEL: Well, yes, some plants have
8 -- they have to plug the tubes.
9 JUDGE ELLEMAN: Yes. And are they hard to
10 detect sometimes, aren't they? If your secondary
11 water supply is pretty pure, isn't it difficult to
12 pick up whether you've got a leak in a secondary
13 condenser?
14 MR. DEHMEL: No, because remember that the
15 focus is on tritium, but once you get tritium you also
16 get the other radionuclides and again you have those
17 tell-tale indicators, those easy-to-detect
18 radionuclides.
19 JUDGE ELLEMAN: Okay, so you've got an
20 indicator.
21 MR. DEHMEL: You have an indicator. And
22 they're monitoring the system on the condenser system
23 that you can actually, these are operational monitor
24 to determine whether or not there is a problem. So
25 there are ways of being able to determine whether you

1 have a problem.

2 JUDGE ELLEMAN: Okay, so you get a heads

3 up not from the tritium but from the other radioactive

4 materials that start here. But would you agree that

5 the tritium that's coming off the spent fuel pool,

6 tritium that's getting through ruptures in the

7 condenser, tritium that's coming out of valves, out of

8 pump seals, those materials may be passing, bypassing

9 your detection system.

10 Now the part that goes into the

11 radioactive drains, you would capture that, but

12 anything that escapes that gets by the detection

13 system, doesn't it?

14 MR. DEHMEL: Your Honor, you have to

15 remember that the buildings are ventilated. And all

16 of the gaseous effluent that essentially moved by the

17 exhaust ventilation system as part of the overall HVAC

18 systems, you have one for the reactor building, you

19 have one for the spent fuel building and so on. All

20 of these gaseous effluents are essentially monitored.

21 They go through a common discharge point.

22 The discharge point is monitored the same

23 way we monitor liquid effluents. And some cases the

24 discharge point is terminated based on a release.

25 Some times it's not, but at least the operators are

1 alerted to the fact that there's a gaseous effluent
2 release that essentially is above technical
3 specifications --
4 JUDGE ELLEMAN: We're talking about
5 gaseous --
6 MR. DEHMEL: Gaseous, right. Which would
7 include in this case what you might say -- tritium
8 containing water that would become evaporated. It
9 would be entrained by local exhaust ventilation
10 system, mixed through the various systems and out to
11 the plant stack. But again, the plant stack is
12 monitored and it looks for a number of radionuclides.
13 Obviously, it doesn't look for tritium, but again,
14 there's an operational history and then you actually
15 define what your set point should be on the plant
16 stack, the same you do for liquid effluent, to
17 essentially confirm that if you're releasing this
18 rate, and your alarm set point is based on the
19 following tell-tale radionuclide, that as long as you
20 proceed on that basis and the alarm doesn't trip, that
21 you meet all requirements.
22 JUDGE ELLEMAN: And that works as long as
23 the tritium is going along with other isotopes. But
24 if the tritium is coming out of the spent fuel pool by
25 evaporation, you're not going to have the other

1 isotopes to trigger it. Tritium goes and you don't
2 even know it goes. Isn't that correct?
3 MR. DEHMEL: That's correct, but there are
4 for -- if you look at the tech specs, there are
5 specific requirements or you sample for tritium alone
6 where you know for sure you cannot sample it -- or you
7 cannot monitor to a piece of equipment.
8 JUDGE ELLEMAN: You sample in the source.
9 MR. DEHMEL: You sample in the building.
10 You sample --
11 JUDGE ELLEMAN: Air samples.
12 MR. DEHMEL: Air samples. Determine where
13 the ambient concentration of tritium is and then you
14 know the exhaust ventilation rates, so many thousand
15 cubic feet per minute and you can calculate the
16 concentration and/or the release rate and then compare
17 those values to the technical specifications.
18 JUDGE ELLEMAN: And you do that by using
19 a gaseous detector that will pick up tritium or by
20 running a sample through water to do liquid simulation
21 counting or some method like that?
22 MR. DEHMEL: That could be the simplest
23 method, essentially bubbling air through a water or
24 you can use chemical to extract the tritium from the
25 air, or the moisture from the air, I should say. Or

1 there are some commercially available tritium monitors
2 that typically are used for occupational radiation
3 exposure. And depending on does that give you the
4 kind of sensitivity that you're looking for. Again,
5 that's kind of an operational issue and has to be
6 determined by the Applicant.
7 JUDGE ELLEMAN: Okay, well, look, I guess
8 I don't need to pursue this any further. I guess the
9 point I was working toward is when you pull numbers
10 for tritium release, that's a part of the tritium.
11 There's other tritium that you're not seeing and
12 that's possibly coming from that plant that you may or
13 may not know about.
14 MR. DEHMEL: In the context of the SER,
15 and the context of the EIS, the analysis consider
16 tritium and all the other radionuclides that are
17 listed in the application as part of no more routine
18 effluent releases that are under the immediate control
19 of the Applicant, in the context of the regulatory
20 requirement, the tech specs, Appendix I requirement,
21 the off-site dose calculation manual.
22 The releases you're talking about, those
23 abnormal releases, we don't account for those because
24 we don't know what they are.
25 JUDGE ELLEMAN: Yes.

1 MR. DEHMEL: Now you could say could you
2 apply fudge factor to it. You don't say well, we're
3 going to multiply the existing result by 1.1. That's
4 not the procedure. The procedure is the Applicant
5 says this is how much I'm going to release on the
6 stack and from the discharge pipe. That's the number
7 I use. I just cannot speculate as to what would be
8 the delta. I can ask the Applicant as to whether or
9 not is the 850 reasonable. I can ask that question.
10 But I cannot, on my own, add a multiplier to that and
11 say well, based on this, I think that it should be
12 increased by a factor of 10 percent, 20 percent. I
13 just cannot do that.
14 JUDGE ELLEMAN: Operators of plants and
15 the Applicant's quote numbers as tritium released to
16 the air, tritium released to the water, but the
17 tritium release to air is as water. It almost
18 immediately exchanges with whatever nearby water body
19 there is, isn't it, and ends up distributed between
20 the air and the water. Isn't that true?
21 MR. DEHMEL: I don't think so. I remember
22 reading an SERP report where I thought the same thing
23 and I remember reading an SERP report that this had
24 changed process, is not instantaneous as you would
25 think it would be.

1 JUDGE ELLEMAN: Really?

2 MR. DEHMEL: Yes. I think it's SERP

3 report No. 62. It's kind of interesting. But that's

4 all I can say.

5 JUDGE ELLEMAN: Okay. Help me out with

6 something I had trouble understanding. I think all

7 three of us have health physics backgrounds. So we

8 know that the way that you come up with allowable

9 levels of radioactive material --

10 JUDGE KARLIN: All three of whom?

11 JUDGE ELLEMAN: Excuse me.

12 (Laughter.)

13 JUDGE KARLIN: Don't pull me into that.

14 (Laughter.)

15 JUDGE ELLEMAN: I'm correct, aren't I, in

16 saying that the way you decide what is an allowable

17 level of any radioisotope is you run experiments on

18 add-ons and with people and you learn now isotopes

19 distribute within the body, how they segregate. And

20 you find out what organs they concentrate in and you

21 determine from organ masses what is an allowable, what

22 concentration of radioactive material will produce an

23 annual allowable dose to that organ. And then you

24 back-calculate as to what the intake rate would be for

25 that isotope to produce the allowed body burden and in

1 that way you arrive at levels that say this is the
2 maximum level in air or water that you can tolerate
3 for each of the many isotopes that you want to
4 consider.
5 Am I okay in what I've said so far?
6 MR. DEHMEL: Yes, Your Honor, except for
7 the first part --
8 JUDGE ELLEMAN: First part.
9 MR. DEHMEL: The first part is that we,
10 the Staff, do not derive that those conversion factors
11 --
12 JUDGE ELLEMAN: I understand.
13 MR. DEHMEL: Those conversion factors are
14 considered to be constant.
15 JUDGE ELLEMAN: Okay.
16 MR. DEHMEL: They're given in the
17 regulations. They're given to us.
18 JUDGE ELLEMAN: Right. I've realized
19 that. And where I'm going with this is the calculated
20 values for doses of tritium and other radioisotopes
21 that Dominion has come up with and that you have
22 confirmed, are well below these allowable values.
23 They're small fractions of what is allowed to be
24 released.
25 Yet, Units 1 and 2 have come within 47

1 percent of an allowed drinking water level. How can
2 that be? I mean what is the drinking water limit
3 based on?
4 MR. STOETZEL: I'm not sure where you're
5 getting that 47 percent number, Your Honor.
6 JUDGE ELLEMAN: Okay.
7 MR. STOETZEL: Forty-seven percent, I
8 believe, is when we estimated the total release that,
9 the total concentration of tritium that would be in
10 the lake is 9400 picocuries per liter and that was
11 assuming operations of Units 1 and 2 and 3 and 4. So
12 it would be all -- it would be four units, the new
13 units and the proposed units. And I think the 9400
14 was -- that was 9400 and 20,000 picocuries per liter
15 is the EPA drinking water standard. And I think
16 that's where the 47 percent came from.
17 JUDGE ELLEMAN: Okay. I can tell you
18 where I got the 47 percent.
19 MR. STOETZEL: Okay.
20 JUDGE ELLEMAN: And I got it from page H2
21 of the final environmental impact statement and I have
22 a copy here.
23 (Pause.)
24 MR. STOETZEL: I think the 47 percent may
25 have been in one of the responses.

1 JUDGE ELLEMAN: Okay, I guess I'm not
2 seeing that. I'm seeing a 9417 which is not -- as
3 compared against 20,000. That's not quite 47 percent,
4 but it doesn't miss by too much, 46 percent. Okay,
5 I'll accept 46 percent.
6 It's close. It's close to the limit. How
7 is it possible to be close to a drinking water limit,
8 but well below the allowed levels for water
9 concentrations of tritium based on 10 CFR 20 values?
10 MR. DEHMEL: A quick correction. The 9400
11 is not the sole contribution from Units 1 and 2.
12 JUDGE ELLEMAN: Okay.
13 MR. DEHMEL: The contribution alone from
14 the operating unit is about 3,000 picocuries per
15 liter. If you look at the existing plant, based on
16 the slide, the information that Craig presented
17 earlier, it's about 3,000 picocuries per liter.
18 JUDGE ELLEMAN: Okay, but even so, it is
19 -- you are much closer to a drinking water limit than
20 you are to a total body burden limit based on Appendix
21 B values for 10 CFR 20. Is that not true?
22 MR. DEHMEL: No, because remember, 10 CFR
23 Part 20, Appendix B concentration, if you were to
24 expose somebody simultaneously to the concentration as
25 specified for air and water, the sum of those two

1 exposures would be 100 millirem per year.

2 JUDGE ELLEMAN: Yes.

3 MR. DEHMEL: Here, we're talking on the

4 order of a few millirem. Remember, the Appendix I

5 requirement talks about dose of three millirem for

6 total body for liquid effluents and 104 in the organ.

7 If you look at the bases of the EPA drinking water

8 standard, their concern is about 4 millirem per year.

9 JUDGE ELLEMAN: Yes.

10 MR. DEHMEL: So that's what we're talking

11 about. It's a very small fraction of maximum safety

12 limit. If you take 10 CFR 20 as an absolute where you

13 cannot absolutely exceed, so this is a very small

14 fraction.

15 JUDGE ELLEMAN: Maybe I don't want to

16 compare it to the Part 20 Appendix B levels. What I

17 want to compare it to are statements in the safety

18 report and in the EIS that say that projected doses

19 from all radioisotopes and all -- includes tritium --

20 are well below allowable limits. And by well below,

21 I mean orders of magnitude below. Would you concur

22 that that's true for the data in those reports?

23 MR. STOETZEL: We're going to discuss

24 those numbers in this next presentation, but they're

25 not orders of magnitude below. I don't have the

numbers with me --

JUDGE ELLEMAN: But they're not 46 percent, those numbers.

MR. STOETZEL: We're comparing to the doses we estimate are for Units 3 and 4, compared to the Appendix I design objectives. It's 3 -- I think we've projected a --

JUDGE ELLEMAN: Well, I may be clouding things in trying to make the point I'm making which is I can't understand how you can be close to an EPA limit and far away from an NRC limit.

MR. STOETZEL: The EPA drinking water standard, 20,000 picocuries were liter, I believe in 40 CFR part 141 where that is, it says that that would result in less than 4 millirem per year, per millirem annually if somebody ingested drinking water.

JUDGE ELLEMAN: It is not a dose-based limit.

MR. DEHMEL: No, it is. Four millirem.

JUDGE ELLEMAN: Four millirem, okay.

MR. STOETZEL: And what I wanted to add on to that was it says less than four millirem. And if you use the dose factors that are in the -- that we used as part of our evaluation from Reg. Guide 1.109 in the dose code that we use for estimating doses to

1 comparative Appendix I values, assuming the drinking
2 water usage factors that are in Reg. Guide .109, and
3 using the dose factor for tritium, you come up with a
4 dose estimate of approximately on the order of one
5 millirem annually from 20,000 picocuries per liter.
6 So the EPA number is very conservative. They say four
7 millirem. I think it says less than four millirem and
8 it is -- it's more on the order of one millirem.
9 JUDGE KARLIN: Can I jump it?
10 MR. DEHMEL: Yes.
11 JUDGE KARLIN: In the EPA drinking water
12 standard, are you familiar that they have something
13 called maximum contaminant levels and that is the
14 drinking water standard, the maximum contaminant
15 level?
16 MR. DEHMEL: Yes.
17 JUDGE KARLIN: And they have a maximum
18 contaminant level goal, are you familiar with that?
19 MR. DEHMEL: Yes.
20 JUDGE KARLIN: And what is the maximum
21 contaminant level goal for tritium or all carcinogens?
22 MR. DEHMEL: I cannot answer that question
23 for all carcinogens.
24 JUDGE KARLIN: Do you know for maximum
25 contaminant level goal for tritium is the same maximum

1 contaminant level goal for all carcinogens and that's
2 zero. Do you remember that or do you know that?
3 MR. DEHMEL: No, I do not know that. We
4 use the four millirem for the tritium.
5 JUDGE KARLIN: Let me just -- so EPA has
6 a maximum contaminant level goal under the Safe
7 Drinking Water Act for tritium of zero. That's the
8 goal, zero. And zero is impossible EPA says, so they
9 just said a maximum contaminant level, MCL, which is
10 the EPA drinking water standard we're referring to and
11 that's 20,000 picocuries per liter which converts to
12 as I think you're saying 4 millirem, according to EPA.
13 MR. DEHMEL: According to EPA, correct.
14 JUDGE KARLIN: And EPA bases that standard
15 on how many cancer deaths per million people exposed
16 to that kind of drinking water, do you know?
17 MR. DEHMEL: No, I don't know.
18 JUDGE KARLIN: I think it's 10^{-5} to 10^{-6},
19 100,000 to 1 in a million and EPA feels that that's
20 the maximum level of cancer deaths that should occur
21 if someone drinks that water. Are you familiar with
22 that's the basis for then putting that level in there?
23 MR. DEHMEL: Yes, I'm familiar with that,
24 that the range you just quoted.
25 JUDGE KARLIN: Okay. So that's kind of

1 what they're shooting for, if you have one cancer
2 death and 100,000 people drinking this water, that's
3 okay. Anything more than that, that's problematic.
4 And that we're dealing with something which is less
5 than that, considerable less than that, 47 percent of
6 that, I guess.
7 Are you familiar if there's a linear
8 threshold, linear no dose assumption for carcinogens?
9 MR. DEHMEL: Yes, Your Honor.
10 JUDGE KARLIN: Okay. That's all.
11 JUDGE ELLEMAN: Okay, but I think you've
12 resolved my dilemma. It sounds like EPA is playing
13 with a different set of rules than NRC is playing with
14 in terms of what is an acceptable dose limit. Would
15 you accept that?
16 MR. DEHMEL: I can't comment on the
17 underlying basis of the EPA, you know, radiation
18 protection standard. The only thing I can tell you is
19 that in the implementation aspect of monitoring and
20 controlling radioactive effluents of a nuclear power
21 plant, not only do we look at 10 CFR part 20. We look
22 at a dose -- the design objective of Appendix I and we
23 also -- our concern about exceeding the EPA drinking
24 water standard.
25 JUDGE ELLEMAN: Yes.

1 MR. DEHMEL: That's all I can tell you.

2 JUDGE ELLEMAN: It's a limit. You can't

3 exceed it, can you? If it says legal limit, you have

4 to stay below.

5 JUDGE KARLIN: I don't think so.

6 JUDGE ELLEMAN: No? Okay.

7 JUDGE KARLIN: I mean EPA's drinking water

8 standard is imposed on drinking water providers, that

9 is if you're providing drinking water to a public

10 source, then that can't exceed that. But if nobody is

11 drinking the water, then it's not applicable.

12 JUDGE ELLEMAN: Okay. But I think you've

13 given me the basic answer I need in saying that the

14 dose that comes from tritium in a drinking water

15 standard is much lower at the limit for that drinking

16 water by the EPA standard than NRC would accept this

17 as an acceptable dose for tritium in water. They're

18 different bases.

19 MR. DEHMEL: Yes, Your Honor. It is

20 correct. It is lower than 10 CFR part 20, that's

21 correct.

22 JUDGE ELLEMAN: Yes.

23 MR. DEHMEL: Absolutely.

24 JUDGE ELLEMAN: Which explains why you can

25 be close to one limit, but not close to another.

1 MR. DEHMEL: But essentially it's the same
2 order of magnitude, 3 versus four millirem for liquid
3 effluent if you compare the EPA dose limit to Appendix
4 I. Liquid effluent which is 3 millirem per year for
5 the whole body and 10 for any organ. So in the
6 context of Appendix I, there is close parity between
7 the EPA standard as well as the Appendix I dose
8 objectives. It's quite different in the context of 10
9 CFR Part 20, because there, the dose limit is 100
10 millirem from all sources of --
11 JUDGE KARLIN: I'd like to add, if I may,
12 the three millirem that's the NRC dose objective, is
13 that a dose objective, it's not a legal requirement,
14 is it?
15 MR. DEHMEL: It's a requirement, but it's
16 not a safety standard. There's specific verbiage in
17 Appendix I that says that these are design objectives,
18 but they're not safety standards. I think maybe
19 somebody can confirm that.
20 JUDGE KARLIN: It would be ultimately a
21 legal question, but I think we did ask those questions
22 in our questioning of the written and I think it's a
23 goal, not a legal requirement as the EPA drinking
24 water standard is for drinking water. That is a hard
25 and fast standard. If you exceed a year in violation,

1 if you exceed the three millirem under the NRC
2 standards, you're not in violation of anything, you
3 just didn't make the goal.
4 There are other standards that NRC has,
5 certainly, but three millirem is not a legally-
6 mandated violation if you exceed it.
7 MR. DEHMEL: It does not mean that you're
8 Scott-free because you exceeded a goal in Appendix I.
9 There are some regulatory implications with that. And
10 there's one reason why we urge the Applicant to
11 change, to reconsider the 3100 curies for the tritium,
12 because not only did want to essentially issue an ESP
13 permit knowingly violating another federal agency
14 criteria, so that's why it was revised from 3100 to
15 8500, so we were very conscious of that.
16 JUDGE KARLIN: I think that was a good
17 thing, 3100 to 850.
18 MR. DEHMEL: I'm sorry, yes, if I
19 misspoke, it's 3100 to 850. I'm sorry.
20 JUDGE ELLEMAN: When I first started
21 reading all of the material that we've had to go
22 through for this hearing, I had the impression that
23 the plant parameter NWAR values had some enforceable
24 characteristic associated with it and I've now
25 concluded that's not really true, that the PPE values

1 are a best estimate calculation of what might occur.
2 But if those numbers are exceeded
3 substantially in an operating reactor, nothing happens
4 from a regulatory standpoint, so long as you're
5 staying within the limits that are specified in the
6 regulations. If you're below the Appendix B values
7 for isotope concentrations, if you're below the doses
8 that are allowed for exposure to the general public,
9 the values that were determined for the PPE no longer
10 are relevant or no longer appear. Is that true or
11 have I missed a point here?
12 MR. DEHMEL: If one were to submit an
13 application where the PPE source is quite different,
14 it was outlined in the ESP permit, the staff would
15 obviously look at it, would look at license conditions
16 identified in the SER and compare the Applicant's data
17 for the construction of a plant now. This is not a
18 fictitious plant, right, it's a real facility. And
19 compare those parameters, key parameters to the
20 Applicant's value and for determining whether or not
21 which ones are in or out of bounds. And those that
22 would be out of bounds, then would be what the staff
23 would do is require that the Applicant explains those
24 differences and whether or not -- what are the
25 implications of having a value that's possible higher

1 than was stated in the ESP.

2 And the question at that point, I guess

3 it's a licensing issue and maybe OGC might be better

4 able to answer this, but at that point maybe a

5 variance would have to be sought, an amendment to the

6 ESP permit would have to be sought and I don't know

7 that procedure. It's for someone else to speak about.

8 JUDGE ELLEMAN: But once that plant is

9 operating, the PPE value for say tritium is pretty

10 much gone, isn't it? I mean it's what happens in the

11 real world that becomes the focus from that point?

12 MR. DEHMEL: Yes, because the license to

13 operate the plant is based on the new set of

14 information that is contained in the CO application

15 package. The CO application package then takes two

16 things, right? It marries a technology, an AP-1000,

17 ABWR, to a site; and then when you marry this

18 technology you have to make sure that now you have,

19 you know what kind of reactor system you're going to

20 have. You know what kind of waste process system

21 you're going to have. You know exactly how the

22 discharges are going to occur. You can describe in

23 detail the kind of equipment are going to be used to

24 monitor and control releases, essentially so that CO

25 application becomes an overriding document and then

1 license, and the licensed condition becomes now the
2 governing documents.
3 So whatever was translated from the ESP to
4 the COL, you know, it depends on how the Applicant
5 prepares the CO application package. Some information
6 could be directly translated, others may not. Some
7 other type of information may not. But ultimately,
8 it's the license that governs the requirement to
9 operate the plant and whether a license condition the
10 staff may have imposed and it will be license
11 condition on effluents. There may be licensed
12 condition on many other subjects covered typically in
13 a CO application package.
14 JUDGE ELLEMAN: And those values will not
15 include in any way the PTE commitments. The 850
16 curies per year that Dominion has said they're going
17 to try to meet with the new plants. I mean that --
18 MR. DEHMEL: There will be a new source
19 term. There will be a new gaseous effluence source
20 term. There will be essentially the list that you've
21 seen in the application for liquid effluent gaseous
22 effluent. There will be a new one. But that new list
23 would reflect the technology of the kind of reactor
24 we're dealing with, a PWR, BWR, new estimates of what
25 the best estimate of the effluent releases might be

1 because now you have an NSSS vendor. You know the
2 kind of reactor. You know what kind of waste
3 processing system you're going to have in place, so
4 those values will be essentially all new.
5 JUDGE ELLEMAN: New values.
6 MR. DEHMEL: All new values, correct.
7 JUDGE ELLEMAN: New calculations which may
8 or may not be correct. The real world may be
9 different substantially.
10 MR. DEHMEL: I'm not too sure I would
11 agree with the words "may or may not be correct." It
12 would be different, indeed. It would be different
13 indeed, but nevertheless, the process that we went
14 through in the SER actually confirmed that the
15 effluent releases are in compliance with Part 20,
16 Appendix B concentrations as well as with Appendix I.
17 These calculations will be done over again to confirm
18 that the CO application in light of the new source
19 term is still in compliance with those requirements.
20 And by the way, that would include CFR 190 and the EPA
21 drinking water standard again.
22 JUDGE ELLEMAN: Some questions occurred to
23 me when you went through your slides. You quoted
24 typical tritium release values for PWRs, 800 curies
25 per year on average. Units 1 and 2 have been higher

1 than that, have they not?

2 MR. STOETZEL: I believe they have. I

3 think that those numbers were average values that we

4 took from a report from the NCRP report on tritium and

5 they were average values for I think four or five-year

6 time period in the 1970s from pressurized water

7 reactors and boiling water reactors. We have the

8 data. I think it was a little bit more than -- I

9 can't recall the number right now as far as the

10 average. We had the six-year average for curies

11 released in liquid for looking at their annual, the

12 licensee's annual environmental operating reports. It

13 was more than 800, yes.

14 JUDGE ELLEMAN: Is there an explanation or

15 a reason that you could identify for why they're

16 higher?

17 MR. STOETZEL: We did not look at that.

18 I did not look at that.

19 JUDGE ELLEMAN: All right. On slide 9,

20 you make the comment that there is no monitoring at

21 different depths in the lake. And is there a reason

22 why it might not be desirable to look at depth

23 distributions of tritium?

24 MR. STOETZEL: It's something that's not

25 typically done. I would think that the tritium pretty

1 much diffuses and disperses pretty much evenly unless
2 you have a large temperature gradient, then you could.
3 I've seen numbers, graphs, for example, in the ocean
4 where the tritium concentration is higher on the upper
5 levels and then it drops as you go -- there's kind of
6 like at certain depth, then the tritium concentrations
7 will drop. But we did not evaluate -- we didn't have
8 any data to look at what impact there might be on the
9 depth of the lake and how that might impact -- the
10 tritium levels might vary as a result of different
11 temperatures in the lake.
12 JUDGE ELLEMAN: Yesterday, I heard my
13 associate become slightly enraged over the fact that
14 statements had been made, but no measurements had been
15 made to confirm those statements. Given that tritium
16 levels that are relatively high with respect to a
17 drinking water standard have been reported, it would
18 seem to me there's some merit in looking at -- it
19 isn't that hard to do, to look at distributions with
20 depth.
21 MR. STOETZEL: I would expect to see the
22 higher levels on the surface, I believe.
23 JUDGE ELLEMAN: Yes. That leads to
24 another question. You've got a more or less constant
25 input of tritium in cold water body. You've got a

1 water body of fixed size. You've got a more or less
2 known effluent of that water body. Isn't this the
3 kind of problem that lends itself to modeling, to
4 predicting what the tritium levels and concentrations
5 ought to be?
6 Has NRC given any thought to whether you
7 shouldn't model these kinds of issues?
8 MR. DEHMEL: I think that the Applicant
9 did that in their final safety analysis report for
10 Units 1 and 2.
11 JUDGE ELLEMAN: They did?
12 MR. DEHMEL: I think there is --
13 JUDGE ELLEMAN: For 1 and 2?
14 MR. DEHMEL: Yes, for 1 and 2. But that's
15 not addressed in that level of detail in the ESP
16 application, but there is in 1 and 2, they actually
17 show kind of a water balance between the lake, the
18 reservoir and the amount of water that comes in from
19 other sources, what spills over and I think there's
20 even a component for evaporation. I think yesterday's
21 presentation, they actually show the simplified
22 diagram of that model. The Applicant did that, yes.
23 JUDGE ELLEMAN: Did their predicted values
24 come close at all to the actual values? Do you
25 remember if that was true?

1 MR. DEHMEL: No, I do not know.

2 JUDGE ELLEMAN: Don't know. Okay.

3 JUDGE KARLIN: I was going to say on the
4 issue of stratification of tritium within the lake,
5 since this is heavy water, wouldn't it sink?

6 MR. DEHMEL: No, sir. Not sink.

7 JUDGE COLE: All the sampling for tritium
8 that has been done so far has been at the surface of
9 the lake, is that correct?

10 MR. STOETZEL: That's correct.

11 JUDGE ELLEMAN: Yes, this is not a
12 tritium-related question per se, but I'm going to try
13 it here in the hopes that you might know the answer.
14 In looking over some of the other cases that have been
15 associated with mandatory hearing, I discovered in the
16 November 6, 2006 document from Grand Gulf, the Grand
17 Gulf panel made the following statement that "the list
18 of PPE parameters provided in Ceres ESP," Ceres is the
19 Applicant, "appears to be incomplete with respect to
20 those identified in the Nuclear Energy Institute
21 guidance."

22 I had been unaware there was such a thing
23 as a Nuclear Energy Institute guidance. Do you know
24 whether the PPE values in this hearing are in
25 conformance with or not in conformance with NEI

1 guidance?

2 MR. DEHMEL: I do not know. The only

3 thing I can tell you, as I mentioned earlier, on the

4 PPE concept that the PPE concept has been identified

5 for the AP-1000. We were able to trace it back to the

6 design control document for the AP-1000. For the BWR

7 we were able to trace it back to the values that are

8 in the DCD. For the ESBWR, we're able to trace it to

9 the draft application that GE has sent to the NRC for

10 review.

11 And for the other technologies, we just

12 have what the Applicant provided. The other concepts

13 are essentially conceptual designs with professional

14 judgments as to what the releases might be. So

15 essentially, there's little solid information that you

16 can go to and say well, yes, it could be this or it

17 could be that.

18 JUDGE ELLEMAN: From the answer, I gather

19 you don't have any personal knowledge of what the NEI

20 guidance on plant parameter, PPEs is, is that --

21 MR. DEHMEL: I do not.

22 JUDGE ELLEMAN: You do not, okay. Judge

23 Karlin, I think I have no further questions.

24 JUDGE KARLIN: Judge Cole, anything you

25 might have?

1 Okay, I have a few more and hopefully that
2 will wrap it up.
3 I go to the -- could you refer to page
4 5.59 of the file environmental impact statement which
5 I think is the source of much of the similar
6 information you've displayed on your slides.
7 The amount of -- the document says, for
8 example, there's an estimate of 850 curies per year
9 per unit that will be discharged under the PPE.
10 That's the assumption. Now as I understand that,
11 we're talking about the routine intentional planned
12 releases and that's the amount that would be released
13 under that program.
14 MR. STOETZEL: That's correct.
15 JUDGE KARLIN: It doesn't refer to as Dr.
16 Almuz was talking about earlier, the unplanned,
17 insidious or leaks that might occur and escape the
18 planned discharges.
19 MR. STOETZEL: That's correct.
20 JUDGE KARLIN: All right, you were
21 talking, I think, Mr. Dehmel, about how would one
22 account for those. You multiply it by 1.1 factor or
23 something and how would one do that.
24 One way might be to drop a couple of
25 groundwater monitoring wells down on the existing site

1 somewhere between Units 1 and 2 and the lake and find
2 out how much is leaking through the shallow
3 groundwater. Would that be a way of monitoring or
4 understanding or estimating the unplanned leaks that
5 are escaping into the environment?
6 MR. DEHMEL: That would be one way, but
7 there's nothing in the preparation of looking at the
8 safety side that essentially would require me to ask
9 the Applicant to actually do this. This is an
10 operational issue for Units 1 and 2. It's divorced,
11 in essence, from the application which addresses what
12 is the potential impact for Units 3 and 4 operating at
13 some time in the future with those characteristics.
14 So --
15 JUDGE KARLIN: Okay, so you're saying as
16 a safety function, it doesn't matter?
17 MR. DEHMEL: That's correct. Essentially,
18 what you say -- yes. I think the issue or the point
19 you were referring to yesterday was is the baseline.
20 You mentioned it several times. What is the baseline.
21 Well, the baseline consists of a couple of things.
22 One is there was a pre-operational radiological
23 monitoring program was done before Units 1 and 2 were
24 built, so therefore we know what the tritium
25 concentration was at the site from naturally occurring

1 sources.

2 JUDGE KARLIN: That was there for the

3 baseline for Units 1 and 2.

4 MR. DEHMEL: And now there are the other

5 baselines, supplemented with 20, 30 some odd years of

6 operational history.

7 JUDGE KARLIN: Right, exactly.

8 MR. DEHMEL: Right.

9 JUDGE KARLIN: So there was some sampling

10 done of the baseline before Units 1 and 2 were put in.

11 MR. DEHMEL: That's correct.

12 JUDGE KARLIN: Of groundwater. But there

13 hasn't been any sampling of the groundwater to

14 establish a baseline for Units 3 and 4?

15 MR. DEHMEL: Not that I know of, except

16 for what the Applicant presented yesterday. They said

17 they took the initiative as part of this groundwater

18 protection initiative, to actually drill a number of

19 wells and they presented some results to us yesterday

20 as part of question --

21 JUDGE KARLIN: But didn't they say they

22 had no groundwater monitoring loss for radiological

23 contaminants downgradient to Units 1 and 2?

24 MR. DEHMEL: Yes, there was no

25 information.

1 JUDGE KARLIN: So if you don't look,
2 you're not going to find it. Isn't that where you
3 would look? Don't you have to put a well at
4 downgradient in order to capture or find a leak?
5 MR. DEHMEL: Traditional thinking would
6 say that yes, but first I'm not a hydrologist.
7 Secondly, we have to know what the site
8 characteristics are. The fact that you have buildings
9 and foundations that may have a tendency to change
10 groundwater flow. So this would be best addressed by
11 a hydrologist or best addressed by the Applicant
12 itself.
13 JUDGE KARLIN: We kind of talked about
14 this yesterday, so we don't have to rehash it
15 entirely, but it could be both groundwater, shallow
16 groundwater monitoring wells for radiological
17 contaminants downgradient of the potential sources of
18 leaks. And it could be even soil sampling, I guess,
19 in the vadose zone or something above the groundwater
20 that might show, might, I don't know.
21 Would that show the presence of tritium,
22 if you took a soil sample in the vadose zone?
23 MR. DEHMEL: You might show some tritium
24 contamination. Keep in mind as part of this baseline
25 that during the operational history, any plant upset

1 with respect to spills and leaks that would
2 essentially result in a release, abnormal releases of
3 radioactivity into the environment. All this
4 information is supposed to be catalogued under the
5 requirements of 5075G, so there's a whole,
6 essentially, there is an ever-expanding library, so to
7 speak, database of this information.
8 So part of the baseline, you might say,
9 reflects the information obtained from the routine
10 radiological environmental monitoring program near the
11 site, any sampling that may have been done on site,
12 and this expanding source of information on
13 contamination and spills and leaks, that is required
14 under 5075G. So you have this operational history.
15 JUDGE KARLIN: Well, the operational
16 history, let's talk a little bit about what the
17 lessons learned filed report from September 2006. Did
18 you work on that, Dr. Dehmel or Mr. Dehmel? No, but
19 you're familiar with it?
20 MR. DEHMEL: I'm familiar with it.
21 JUDGE KARLIN: Yes, because you've talked
22 about it before. And -- let's see. And on page ii of
23 that report in sort of the Executive Summary, the task
24 force identified "that under existing regulatory
25 requirements, the potential exists for unplanned and

1 unmonitored releases of radioactive liquids to migrate
2 off-site into the public domain undetected." And that
3 was one of the principal, I think, findings and
4 conclusions of the report. And that's what I'm
5 concerned about.
6 Later on in that same page, it says
7 "contamination in groundwater on-site may migrate off-
8 site undetected." Now what measures could be done to
9 determine, detect, whether the contamination from
10 groundwater on-site is migrating off-site?
11 MR. BIGGINS: Excuse me, Judge. That
12 report that you're referring, that's not in evidence
13 at this time, is it?
14 JUDGE KARLIN: No, it's not.
15 MR. BIGGINS: Okay. We just wanted to
16 know if you were intending to put that in evidence?
17 JUDGE KARLIN: No, I'm ont.
18 MR. BIGGINS: Okay.
19 JUDGE KARLIN: So "contamination in
20 groundwater on-site may migrate off-site undetected."
21 That's from the Liquid Radioactive Release Lessons
22 Learned Task Force Final Report page ii.
23 And what could be done to detect
24 groundwater contamination that might migrate off --
25 put a few wells down. Is that correct?

1 MR. DEHMEL: Yes, that's one solution.

2 JUDGE KARLIN: And you're just saying it's

3 not important because under safety issues, it's not an

4 issue?

5 MR. DEHMEL: Because under the process I

6 have to evaluate, the Applicant tells me that the

7 source term is going to a surface water canal and that

8 empties into the waste heat treatment facility. So

9 I'm bound to essentially look at this analysis in that

10 context. If the Applicant had told me that instead of

11 going into the discharge canal, the pipe was directly

12 directed downward and into a local aquifer, I would

13 have evaluated the impact on groundwater. I did not.

14 The issue of what is the impact once the

15 liquid effluents, for example, are in the surface

16 water, that becomes a CO action item because the

17 Applicant will have to determine and document the fact

18 that it, in this case, let's assume the same entity,

19 operating entity, that the current radiological

20 environmental monitoring program is adequate to

21 essentially support the addition of two more plants

22 and make appropriate changes to the radiological

23 environmental monitoring program.

24 JUDGE KARLIN: All right. On page 22 of

25 that report, they had a recommendation, Section

1 3.2.1.4, as these things go, and it says, "the NRC
2 should require adequate assurance that leaks and
3 spills will be detected before radionuclides migrate
4 off-site via an unmonitored pathway."
5 It seems to me the only way you can do
6 that is require somebody to drop some groundwater
7 wells. Are there other ways that could be done for
8 this problem, tritium, I mean?
9 MR. DEHMEL: Yes, you can essentially
10 local sumps and that essentially would be kind of
11 early warning systems, so to speak, where you might
12 have a release that would occur, it would be
13 channelled to one of these early warning collection
14 system sump and so on. And then you could
15 periodically go to those sumps and first note whether
16 there's any water, take a sample.
17 JUDGE KARLIN: Okay. That makes sense,
18 another way of monitoring.
19 MR. DEHMEL: There are other ways of doing
20 this, yes. It doesn't mean that you would exclude
21 wells. You still could do it, but by the time you're
22 monitoring in a well, it's kind of late. So the idea
23 that you have to have an early sentinel system that
24 will essentially capture any releases and those could
25 be engineered in place, meaning that you know where

1 the rad waste pipe is, you know where the sumps are in
2 the plant and so on, so you could look at the
3 structure and where the system with the piping is and
4 locate those early sentinel systems at locations that
5 would be -- essentially give you an early tell-tale
6 indication there is something amiss.
7 JUDGE KARLIN: Yes.
8 MR. DEHMEL: And then you could have
9 beyond that, as an outer ring, you could have a number
10 of observational wells, yes.
11 JUDGE KARLIN: Right, right. Okay.
12 That's all the questions I have. Anything else?
13 All right. Let's see, Staff, Ms. Poole,
14 do you have any clarification questions?
15 MS. POOLE: With the Board's permission,
16 we have three brief matters to clarify or four.
17 JUDGE KARLIN: All right, questions for
18 the panel.
19 MS. POOLE: Two questions for the panel
20 and then I'll take the third item in order, if that's
21 all right.
22 JUDGE KARLIN: That's fine.
23 MS. POOLE: First, a question for Mr.
24 Dehmel. The context of this question is early in your
25 presentation you were discussing with Judge Karlin the

1 case of events, a protracted leak or for example, a
2 tank rupture. At that time you made reference to
3 Chapter 15 of the final safety evaluation report which
4 refers to design, addresses design basis accidents.
5 The accidental releases you were discussing from the
6 tank rupture from a protracted leak, those are not
7 design-based accidents, are they?
8 MR. DEHMEL: No, they're not. They're
9 addressed separately in the SERP, Chapter 11.2 which
10 essentially addresses the rupture, the partial rupture
11 of a tank containing radioactive liquid and what is
12 the impact to the nearest source of water supply and
13 that could be surface water or it could be
14 groundwater. So that's contained in Chapter 11.2.
15 JUDGE KARLIN: But they're not design-
16 basis accidents?
17 MR. DEHMEL: That's correct.
18 JUDGE KARLIN: Yes, okay. Good.
19 MS. POOLE: And you also stated they were
20 not severe accidents as the Staff considers them,
21 correct?
22 MR. DEHMEL: That's correct, they're not
23 severe accidents.
24 MS. POOLE: Just a moment ago, this would
25 be item 4. Just a moment ago, you spoke of the

1 possibility of inadvertent leakage of unlined sumps,
2 it was actually earlier, excuse me, I'm sorry. Could
3 a design measure, such as lining the sump preclude or
4 otherwise control such potential leakage?
5 MR. DEHMEL: Yes, that's one measure of
6 lining the sump with stainless steel and there are
7 other measures, but the idea of the conversation or
8 the discussion was trying to postulate as to what
9 might be released. So I just assume an unlined sump
10 because that follows the idea of potential release on
11 the sump as opposed to a sump that would be lined and
12 then at that point it would be very little likelihood
13 of any release on the sump that would be lined with
14 stainless steel.
15 JUDGE KARLIN: We'll get to that in a
16 later session I think, what is the metaphysical
17 definition of preclude. Does that mean render
18 impossible or just reduce the probability of.
19 MS. POOLE: Our third question is for Mr.
20 Stoetzel. Listening to you over here, at one point we
21 heard you state or we thought we understood you to
22 state that the existing units released 800,
23 approximately 800 curies a year together. However,
24 later, in response to a question from Judge Elleman,
25 we understood or thought that you said it would be a

1 release of 800 curies a year per reactor. Would you
2 clarify which is correct?
3 MR. STOETZEL: It's 800 curies per year
4 for both units 1 and 2, combined.
5 MS. POOLE: Okay, thank you very much.
6 Our fourth item is a request. We would request the
7 Board in order to respond to Judge Elleman who
8 proposed a question about condenser leakage, if with
9 the Board's permission, we would like to briefly offer
10 Andrew Kugler who has been identified on our witness
11 list for another issue, to respond to that question.
12 The reason we would ask that is that the question had
13 an element of plant design in it that the health
14 physicists are not equipped to answer.
15 JUDGE KARLIN: Sure. Is he ready to speak
16 right now?
17 MS. POOLE: I believe so.
18 JUDGE KARLIN: That would be great.
19 MS. POOLE: He's not been previously sworn
20 though.
21 JUDGE KARLIN: If I may, please raise your
22 right hand.
23 WHEREUPON,
24 ANDREW KUGLER
25 WAS CALLED FOR EXAMINATION BY COUNSEL FOR THE NRC AND,

1 HAVING FIRST BEEN DULY SWORN, WAS EXAMINED AND
2 TESTIFIED AS FOLLOWS:
3 JUDGE KARLIN: Please sit down and
4 identify yourself, sir.
5 THE WITNESS: My name is Andy Kugler. I'm
6 a Senior Environmental Project Manager in the Office
7 of New Reactors. In terms of the answer I'm going to
8 give, some of my past history. I've worked at a
9 nuclear power plant. I was a start-up engineer and
10 system engineering supervisor. I was also a licensed
11 operator. And for 10 years I was the licensing
12 project manager for the NRC.
13 The issue that I wanted to talk about had
14 to do with condenser tube leaks and the issue of
15 potential tritium releases related to that. What I
16 wanted to point out is by design and almost by nature,
17 the way the condenser operates, the steam side of the
18 condenser is under a vacuum and the cooling water side
19 is under a positive pressure. So when you have a tube
20 leak, the leakage is going to be from the cooling
21 water system into the condenser, steam side and not
22 the other direction. So tritium leakage should not be
23 an issue for condenser tube leaks. I just wanted to
24 make that clarification.
25 JUDGE KARLIN: Any questions on that?

1 JUDGE COLE: Well, isn't the steam
2 eventually condense?
3 THE WITNESS: It does, but it doesn't
4 reach a positive pressure until it goes -- a condenser
5 or the condensate pumps typically take it from that
6 negative pressure and pump it up and then a few water
7 pumps --
8 JUDGE COLE: It will leak somewhere else?
9 THE WITNESS: Eventually, yes, in some
10 other system or in the building. But it wouldn't be
11 a leak into the cooling water system that then would
12 go directly back out to the lake.
13 JUDGE COLE: Understood.
14 JUDGE KARLIN: Okay, good. Thank you.
15 You guys have been up there for two hours. Yeoman's
16 service here, longer than any other panel so far. We
17 thought it was helpful though and we will now take a
18 break. I realize now that there is a clock in the
19 back of the room. So rather than trying to use mine,
20 why don't we use that clock. It shows 11 o'clock
21 right now. Let us reconvene in 10 minutes at 11:10.
22 We are now adjourned.
23 (Off the record.)
24 JUDGE KARLIN: We are back in session,
25 continuing with the Atomic Safety Licensing Board

1 evidentiary hearing. We are now moving to the second
2 half of I guess topic number three, which is tritium.
3 And we will deal with the board of experts and
4 witnesses presented by the applicant, Dominion North
5 Anna Nuclear.
6 With that, absent anything else, we will
7 just ask you all to stand. And so I will just ask you
8 to raise your right hand. I know some of you have
9 already been up here testifying before, perhaps most.
10 (Whereupon, the board of experts and
11 witnesses were duly sworn.)
12 JUDGE KARLIN: Thank you. Please be
13 seated.
14 MR. LEWIS: Judge Karlin?
15 JUDGE KARLIN: Yes?
16 MR. LEWIS: Can we just hand out the
17 presentation materials?
18 JUDGE KARLIN: Okay. Yes.
19 MR. LEWIS: This is a panel of Mr. Carl
20 Tarantino, Donald Hintz, Ken Jha, and Dr. Stewart
21 Taylor. We did work with the staff to try and avoid
22 duplication. So we will really try not to repeat some
23 of the material and elaborate on what we thought was
24 important. But the panel is prepared to answer
25 questions and any of the areas that have been

1 discussed.

2 JUDGE KARLIN: Good. Okay. That is the

3 way we want to do it.

4 Mr. Smith, are you taking off here?

5 MR. SMITH: I am, Judge Karlin. I am

6 Marvin Smith. I am the project director for the early

7 site permit project. I wanted to just make a couple

8 of comments initially on this topic. And then we will

9 proceed with the rest of our presentation.

10 There has been a good deal of discussion

11 about tritium in groundwater and tritium in the lake,

12 tritium sources, et cetera. And I would just like to

13 make a couple of comments on that.

14 First, the tritium collection that we have

15 done in the site characterization indicates a couple

16 of things: that the groundwater gradient, as has been

17 discussed, is from either the existing units or the

18 early site permit area into the lake and in that

19 direction. In general, the tritium measurements we

20 have seen have been -- the ones we have done in the

21 groundwater have been less than the actual

22 concentrations measured and the like.

23 Another couple of points on tritium are

24 that the units of measure we are talking about here

25 should be understood to be very small. When you are

1 measuring picocuries per liter, that is a trillionth
2 of a curie, much less than one becquerel. And so you
3 are measuring very small numbers.
4 So when you take a tritium sample to make
5 that kind of measurement, you have to distill it to
6 get the other radioactive materials out and do liquid
7 scintillation counting for a protracted period of time
8 to measure it. That does result in error bars,
9 typically of the order of 800, plus or minus 800.
10 So when you see a number that you have to
11 understand that you see a number of 500 or 1,000, you
12 know, really, there is a significant error bar in the
13 context of those kinds of low numbers.
14 JUDGE ELLEMAN: Plus or minus 800
15 picocuries per liter?
16 MR. SMITH: Right. I think Carl can deal
17 with that a little more, but I think that is -- Carl,
18 is that typically --
19 MR. TARANTINO: That's a typical --
20 MR. SMITH: Typical.
21 JUDGE ELLEMAN: And would that be a
22 function of different kinds of analytical methods or
23 is there only one?
24 MR. SMITH: I am sure it is a function of
25 the exact way you do the analysis, but --

1 JUDGE ELLEMAN: Some would be more
2 sensitive than others.
3 MR. SMITH: That's true, but, again, to
4 see the kind of small numbers --
5 JUDGE ELLEMAN: In context.
6 MR. SMITH: -- we are looking for, you
7 typically maybe have to count four hours and
8 accumulate a lot of statistics. And just inherent in
9 that, there is some uncertainty when you make these
10 measurements.
11 So when you see some of these low numbers,
12 there is some inherent uncertainty. If you see a
13 number of 500, well, is that above background or not?
14 With an error bar of 800, you can't say definitively
15 it is or it isn't. So I think it is important to note
16 that we are looking for very small numbers.
17 And, as has been discussed earlier, this
18 EPA drinking water standard itself is a very
19 protective, very limiting standard that EPA has set
20 that would apply if this were your entire source of
21 drinking water. So I just want to preface the
22 presentation with that information.
23 JUDGE ELLEMAN: If your error bar includes
24 zero, you do not report that as zero, do you? You
25 report it as --

1 MR. SMITH: Well, you will numbers less
2 than, for example, et cetera, less than this value,
3 and so forth. So no, you don't report zero.
4 MR. TARANTINO: May I add to that comment?
5 Carl Tarantino, corporate health physicist.
6 And this is, in particular, for vendors
7 being used to do the analysis. They may have their
8 own protocols, and there could be a zero that they use
9 as part of their protocol.
10 But they will define that as meaning that
11 it is less than, in their way, saying it is less than
12 either the MDC or whatever. So you might see it in a
13 report. And if you do, it is because it is a vendor
14 protocol.
15 Again, we established that plant parameter
16 envelope for the purposes of looking at the early site
17 permit. And, really, the early site permit is, in
18 fact, based upon that plant parameter envelope. And
19 then at the combined license stage if we get to that
20 point and reference this early site permit, we have to
21 clearly establish that we are within those plant
22 parameter envelope values or if we're not, we have to
23 go through a very careful justification to show we're
24 not.
25 There was some discussion about the

1 approval of any specific design. Again, the early
2 site permit doesn't approve or disapprove any specific
3 design for the site. It is meant to define a plant
4 parameter envelope that says this site is acceptable
5 for technologies that fall within that.
6 There was a little bit of questioning
7 about the ACR-700. And it was the source of the
8 original 3,100 curies of source term to liquid
9 effluent. We did go back and have some further
10 discussions when we lowered it to 850. Again, not
11 that we are at this point contemplating using the
12 ACR-700, but we did want to go back to Atomic Energy
13 Canada Limited and basically get a little better
14 understanding of the tritium in the context of that
15 reactor design.
16 That reactor design I wanted to indicate
17 uses heavy water in a low-pressure colandria tank as
18 a moderator. It does not use heavy water in the
19 reactor coolant system, as is the case for the
20 traditional CANDU reactors that are in use in Canada
21 today.
22 One of the consequences of that is that
23 the tritium that is created within that heavy water
24 would be recirculated into that low-pressure colandria
25 tank. In reality, you would expect very, very little

1 of that tritium to be released into the environment.
2 Again, because of the nature of the design and,
3 frankly, because of the extremely high value of heavy
4 water, heavy water is a very expensive material to
5 separate from ordinary water, existing ordinary water
6 in small concentrations.
7 And so in discussing this with AECL, that
8 number represents more characterization of how much
9 tritium might be created in the heavy water colandria
10 tank, most of which would be retained and recirculated
11 there, not released. That again would be an issue
12 that you would deal with at a combined license stage
13 and really not particularly relevant to the early site
14 permit, where we are establishing this envelope. It
15 is not correct to characterize it would necessarily
16 preclude that design from consideration later if we
17 could, in fact, establish to the satisfaction of the
18 NRC that you would be able to do that for that design.
19 JUDGE COLE: So the 3,100 was provided by
20 AECL?
21 MR. SMITH: It was, yes.
22 JUDGE COLE: Thank you.
23 MR. SMITH: All of the numbers that we
24 show in the plant parameter envelope, we went through
25 a process of requesting each of the reactor vendors

1 for those designs to provide those numbers.

2 JUDGE KARLIN: And so the reactor vendor

3 for the ACR-700 --

4 MR. SMITH: ACR-700 is actually the vendor

5 on Atomic Energy Canada Limited. And they are the

6 ones that provided us that number. And, again, I

7 think we encourage the vendors to be conservative in

8 the numbers they provided us. In other words --

9 JUDGE KARLIN: Does that vendor say that

10 they could meet 850 --

11 MR. SMITH: Yes. We have not gone back to

12 ask them specifically "Would you meet 850?" We did go

13 back and say, you know, "What is the basis of the

14 3,100?"

15 JUDGE KARLIN: Is it your testimony that

16 it could meet 850?

17 MR. SMITH: Again, I would not

18 characterize that I'm testifying that it would meet

19 850. I would say that it could meet 850. In other

20 words, you're looking at most of the tritium being

21 created in this low-pressure colandria tank. You

22 would have to be very careful in designing that tank

23 to preclude leakages or limit leakages. And they are.

24 They do that.

25 So I can't testify that you would be able

1 to achieve that. I can certainly say that I believe
2 in my professional opinion you could achieve it, yes.
3 JUDGE KARLIN: And what is the basis for
4 that? I mean, if the actual manufacturer is saying it
5 is 3,100 curies per liter, on what basis can we jump
6 to --
7 MR. SMITH: Well, again --
8 JUDGE KARLIN: -- one-fourth of that value
9 as meeting the plant parameter envelope?
10 MR. SMITH: Yes. Yes, Your Honor. Going
11 back and asking Atomic Energy Canada Limited sort of
12 "What was your basis when you provided that number?"
13 they were more or less looking at the number of curies
14 per year of tritium that would be created by neutron
15 absorption in the deuterium in the colandria tank.
16 How much of that tritium would actually
17 end up being discharged from the plant versus creating
18 in the plant is quite a different matter. So in going
19 back and discussing it with them they indicate that
20 they do take -- again, they have a higher tritium
21 production in the heavy water than you see in light
22 water.
23 On the other hand, they do take a lot of
24 care with that heavy water to make certain that it,
25 particularly in this design -- again, in the

1 traditional CANDU reactors that they are more familiar
2 with and have longer experience. Heavy water is used
3 under very high pressure, high temperature as a
4 circulating coolant where you would typically see a
5 greater amount of leakage in the plant systems that
6 might go into effluents.
7 In the case of the colandria tank, again,
8 it's under a low pressure or low temperature when the
9 reactor is operating and it recirculates and would be
10 much less likely, frankly, to end up in liquid
11 effluents.
12 JUDGE KARLIN: There are, therefore, as I
13 understand, a number of ACR-700 reactor designs in
14 operation around the world?
15 MR. SMITH: No.
16 JUDGE KARLIN: No?
17 MR. SMITH: The ACR-700 is a new design.
18 JUDGE KARLIN: Okay.
19 MR. SMITH: Okay? The --
20 JUDGE KARLIN: It's not the CANDU reactor
21 --
22 MR. SMITH: It's not the CANDU.
23 JUDGE KARLIN: -- that is in use and in
24 existence.
25 MR. SMITH: CANDU reactors use not only

1 heavy water in a colandria tank as a moderator. They
2 also use heavy water in the reactor coolant.
3 JUDGE KARLIN: Okay.
4 MR. SMITH: The ACR-700 has switched to
5 using light water, normal light water, in the reactor
6 coolant. So the circulation --
7 JUDGE KARLIN: So there is no actual data
8 on the ACR-700?
9 MR. SMITH: There is no actual data to
10 base it on. So, again, I think they were quite
11 conservative in sort of basing it off their experience
12 with the CANDU 6 and really gave us a number that they
13 believe at this point they could demonstrate that the
14 actual that you would expect would be substantially
15 less than that.
16 Again, that's not a design we're
17 considering. And that would be an issue that would
18 have to be dealt with in detail at the COL stage. But
19 it is a design we looked at. And in discussing it
20 with them, I don't think it should be characterized as
21 being precluded. Certainly it would be a bigger
22 challenge.
23 A lot of discussion about the production
24 of tritium and how it is handled and processed, again,
25 the primary issue we are talking about here is in

1 liquids and tritiated water, which it should be noted
2 that when you go to a liquid waste processing system,
3 it is much easier to remove most of the radionuclides.
4 You can do that through chemical processes, et cetera.
5 Tritiated water is chemically identical to water. And
6 so it's very difficult to remove the tritium from that
7 tritiated water.
8 And in terms of release potential, any
9 leakage into the groundwater, you know, the pathway
10 would be from the groundwater to in the case of the
11 North Anna site the lake.
12 And so as far as it being unmonitored, Mr.
13 Tarantino will deal somewhat with the groundwater
14 protection initiative and what we are doing there for
15 the existing units. And we can also discuss what we
16 would be committed to for the early site permit.
17 So if it is acceptable, then, we would
18 like to go to the next slide. And Mr. Tarantino will
19 talk about the effluent monitoring and control for the
20 existing units.
21 JUDGE KARLIN: So we are on slide 3 at
22 this point, for the record?
23 MR. TARANTINO: That is correct, Your
24 Honor.
25 Thank you, Mr. Smith. Your Honor, I will

1 be presenting today the releases from the existing
2 plant, North Anna units 1 and 2. Again, for the
3 record, I am Carl Tarantino, corporate health
4 physicist, Dominion.
5 This first slide, number 3, that I am
6 presenting states that "Releases are carefully
7 controlled and monitored under the radiological
8 effluent monitoring program." Earlier this morning
9 much has been discussed on our effluent monitoring
10 program.
11 The purpose of introducing this slide
12 right here because we are going to further discuss
13 this program and topic 4 is to make the point that all
14 of the releases from North Anna units 1 and 2 are
15 controlled under the regulations.
16 And those regulations encompass, as has
17 been mentioned previously, not only 10 CFR part 20 but
18 40 CFR 190 and then 10 CFR 50 appendix I and then the
19 40 CFR 141. So when I say, "regulatory limits," all
20 of those documents are under that envelope.
21 Next slide.
22 JUDGE ELLEMAN: Before you leave that
23 slide, Mr. Tarantino, you had supplied us with this
24 similar information, I believe, in response to
25 questions. I was puzzled by the fact that you get a

1 rather wide variation. In the liquid effluents, you
2 have got a factor of three. The gaseous, there's a
3 factor of, what, a little over five between the high
4 and low.
5 The plant has been operating presumably at
6 its maximum capacity factor for the periods of time
7 preceding this. But why does one get this wide a
8 fluctuation?
9 JUDGE KARLIN: You're referring to slide
10 number four at this point?
11 JUDGE ELLEMAN: Slide number 4. That's
12 correct.
13 MR. TARANTINO: I was still back on slide
14 3.
15 JUDGE ELLEMAN: Sorry. I didn't speak
16 correctly.
17 MR. TARANTINO: Okay. Let me see if I
18 will answer this question when I am giving my
19 presentation, but the curies of tritium that we show
20 here, average and, of course, you see the highs and
21 lows for the five-year period, 2000 and 2005, for both
22 units 1 and 2.
23 So in looking at -- let's take the first,
24 the liquid effluents piece of it first. For North
25 Anna units 1 and 2, you can say that the average is

1 per unit basis would be 405 curies. For a typical PWR
2 of the vintage and power level of North Anna units 1
3 or 2 on the order of 1,100 megawatts, then that would
4 be -- or close to 1,000 megawatts. Excuse me. It
5 might be 900 and some, close to 1,000, let's say, for
6 purposes here, that that would be pretty much
7 according to what would be projected for a PWR on a
8 per-unit basis.
9 So a 405 curies of tritium in liquid
10 effluents is an expected --
11 JUDGE ELLEMAN: My question was, why was
12 it only 340 one year and the next year with the plant
13 presumably operating in the same way was 1,110 and
14 similarly with the airborne? Why was --
15 MR. TARANTINO: Some of the years, I mean,
16 we may have one, two scheduled refueling outages. We
17 may have more shutdown time. We have emergent
18 outages. There may be various reasons why the unit
19 may not have been running in a particular year.
20 In a year, that was shut down a greater
21 percentage of time. Just on that alone, you would
22 expect less release of tritium or smaller amount of
23 tritium inventory that would be potentially available
24 for release in the effluents in that particular year.
25 In a year where we would have, let's say,

1 a close to operating 100 percent or near 100 percent
2 year with no refueling outages in that, we would
3 expect to have much higher inventory of tritium.
4 Does that answer your question, Your
5 Honor?
6 JUDGE ELLEMAN: That's a good start on it.
7 MR. TARANTINO: Okay. Continuing with
8 this slide number 4, the second part of it, the
9 tritium activity and gaseous effluents shown, again,
10 the average for the five-year period of 2000 to 2005,
11 there are 160 curies or up to 80 curies on a per-unit
12 basis.
13 Collectively looking at our liquid and
14 gaseous effluent, doses based on a 25-year history
15 that we have had units 1 and 2 running have been well
16 below the regulatory limits and, again, regulatory
17 limits, all of those that I had mentioned.
18 Next slide. Addressing the tritium
19 concentrations in Lake Anna, Dominion has a program
20 for monitoring the amount of tritium that is in Lake
21 Anna. I believe it has been peripherally --
22 JUDGE KARLIN: Let me stop you there. I
23 think we will get into this, but perhaps we might as
24 well go back to slide four, if we could, Mr.
25 Tarantino.

1 MR. TARANTINO: Okay.

2 JUDGE KARLIN: The amounts we re talking

3 about, AE100 or 810, those are the monitored routine

4 intentional releases of tritium. Is that correct?

5 MR. TARANTINO: That is correct, Your

6 Honor.

7 JUDGE KARLIN: Do you have any data as to

8 the unmonitored -- maybe that answers itself.

9 (Laughter.)

10 JUDGE KARLIN: -- but non-routine, such as

11 groundwater migration into the lake?

12 MR. TARANTINO: We have the 10 CFR

13 50.75(g) file that will have historically in the

14 legacy for the spills and leaks, which there were.

15 There's records of the analysis done and what was

16 quantification of those releases that --

17 JUDGE KARLIN: So you are referring to

18 certain events, spillants, spills, and releases?

19 MR. TARANTINO: And some of those, not all

20 of them but a subpart of those, would have been

21 characterized as an unplanned release potentially that

22 would have been reported in an annual effluent release

23 report or throughout this operating history.

24 Some of those spills, leaks if

25 characterized as an unplanned release, liquid or

1 gaseous, would have been captured and put into those
2 reg guide 121 reports or the effluent release reports.
3 So they would have been captured.
4 JUDGE KARLIN: So some of those values are
5 in the numbers you are showing us?
6 MR. TARANTINO: Some of them are. A
7 certain percentage would have been captured there.
8 JUDGE KARLIN: Okay.
9 MR. TARANTINO: Slide number five I think
10 we're on getting into the monitoring of tritium in
11 Lake Anna. For initial licensing purposes of units 1
12 and 2, a predictive modeling, forecast model, was
13 performed to evaluate the buildup of tritium in the
14 lake. This methodology is documented in North Anna's
15 now updated final safety analysis review report.
16 The result of that forecast model
17 projected levels on the order of in the waste -- we
18 refer to the waste heat treatment facility, which is
19 about 3.37 miles south of the plant of about on the
20 order of 5,000, which is the range, 5,000 picocuries
21 per liter.
22 JUDGE KARLIN: Could you repeat that data
23 point? The waste heat treatment facility, is this
24 lagoon number two that we were talking about --
25 MR. TARANTINO: That is.

1 JUDGE KARLIN: -- earlier, the monitoring
2 point?
3 MR. TARANTINO: Yes, Your Honor. And the
4 model that was done --
5 JUDGE KARLIN: And that's how far away
6 from the --
7 MR. TARANTINO: Approximately 3.4 miles
8 south sector.
9 JUDGE KARLIN: South of what?
10 MR. TARANTINO: Of the units, North Anna
11 units.
12 JUDGE KARLIN: Okay. Essentially the same
13 as the discharge point?
14 MR. TARANTINO: Right.
15 JUDGE KARLIN: Okay. And --
16 MR. TARANTINO: It's called the waste heat
17 treatment facility, number two.
18 JUDGE KARLIN: Yes. And the values there
19 are?
20 MR. TARANTINO: The expected tritium
21 concentration as a result of the predictive analysis
22 done for initial licensing, the specific value -- I'm
23 reading it from it right here -- was 5,270 picocuries
24 per liter. And that's --
25 JUDGE ELLEMAN: Which is a little above

1 the reserves, in the ballpark.

2 MR. TARANTINO: In the ballpark. Correct,

3 Your Honor.

4 JUDGE ELLEMAN: How did your model deal

5 with this issue of mixing between the upper and lower

6 levels of the --

7 MR. SMITH: We can comment on that in a

8 little more detail, but I think a couple of points to

9 make about the lake and the way it is operated is

10 that, again, you have once-through cooling for units

11 1 and 2. So the circulating water is removed from the

12 main lake and returned to basic treatment facility.

13 And I guess we can be prepared to discuss the flow

14 rates.

15 But in general there is a very

16 considerable amount of flow. I know there have been

17 questions about there is a small amount of water,

18 comparatively speaking, going through the lake, but

19 the general flow is a circulating flow. In fact, it's

20 interesting to note that the flow from the dam to the

21 plant is actually up river in the sense that flow in

22 that lake is really dominated by the circulating water

23 flow.

24 And so you do have, in fact, a mechanism

25 in place to produce, as I understand, very good

1 mixing. So you would really not expect --

2 JUDGE COLE: How do you know that it is

3 very good mixing?

4 MR. SMITH: Well, again, you are looking

5 at -- do you know the exact flows, Stu?

6 JUDGE COLE: I believe it is about two

7 million gallons a minute.

8 DR. TAYLOR: Yes. I believe the number is

9 1.9 million gallons per minute circular flow rate,

10 roughly 4,200 cubic feet per second.

11 JUDGE ELLEMAN: So did the model then

12 assume homogeneous distribution of the tritium within

13 the lake because of this --

14 MR. SMITH: Yes. Ken did the analysis of

15 that. So --

16 MR. JHA: Yes. I worked on the effluent

17 dosage from the proposed units. And, like was brought

18 up in the last session, there was a question about if

19 it seems like a recirculation system, why can't we

20 just model it? And it was answered that it was

21 modeled for units 1 and 2.

22 The same thing was done for the proposed

23 units. We use the same model to predict the

24 concentrations in the lake.

25 MR. SMITH: And it does assume uniform

1 distribution.

2 MR. JHA: Yes. You have reached an

3 equilibrium, basically, the way the model is set up.

4 JUDGE COLE: Okay. The lake is about

5 14,000 acres, right, say 3,900 in the waste heat

6 treatment facility and 11,000 or 10,000 in the other

7 part?

8 MR. SMITH: I think Stu can answer that.

9 DR. TAYLOR: Yes. The waste heat

10 treatment facility I think the surface area is roughly

11 3,400 acres. And then the balance in the North Anna

12 reservoir is 9,400, I believe, 9,400 acres.

13 But perhaps what you are getting at in

14 your question is it might relate to the

15 stratification, vertical stratification. Is that the

16 nature of your question?

17 JUDGE COLE: Well, you've got a loop

18 there. But the loop doesn't involve the entire 14,000

19 acres because there is a considerable part that is out

20 of that loop. So how many thousand acres are involved

21 in this continuous loop?

22 DR. TAYLOR: Okay. The numbers themselves

23 I can't cite them off the top of my head, but I did

24 have a chance to look at the transport model that Mr.

25 Jha referred to.

1 And it's a two-compartment model. The one
2 compartment comprises the waste heat treatment
3 facility. And then the other compartment is Lake
4 Anna. And it's the portion of Lake Anna basically
5 from the dam up to the intake.
6 So it is not looking at upstream portions
7 of the lake that would be noneffective, would not
8 participate in that transport process.
9 JUDGE COLE: Okay. So this model that you
10 made involved how many acres?
11 DR. TAYLOR: I'm afraid I would have to
12 look at, pull out a document to look at. I couldn't
13 tell you.
14 JUDGE COLE: Okay.
15 MR. SMITH: Again I would suggest it would
16 be the 3,400 plus that portion of the lake, which
17 would be several thousand acres. The exact number is
18 something we need to look at.
19 But in terms of the thermal modeling, as
20 opposed to this other modeling, and in terms of
21 measuring temperatures and looking at all of the
22 thermal modeling, you do see -- and, again, I think
23 you were familiar with the thermal modeling as well,
24 Stu, but, you know, you do see -- do you want to
25 comment on the thermal modeling?

1 DR. TAYLOR: Sure. There was -- what Mr.
2 Smith I think is alluding to is that within the lake
3 itself, it's a stratified system, where you have got
4 a warm water discharge from units 1 and 2, it goes to
5 the waste heat treatment facility. It's a large flow,
6 over 4,000 cubic feet per second.
7 And what you would expect to happen --
8 indeed, we have temperature measurements to confirm
9 this, but as water comes out of this dike 3, it comes
10 out at a relatively high velocity. It mixes with the
11 water in the main reservoir, but then it reforms as a
12 blant layer and then transports upstream back to the
13 intakes for units 1 and 2.
14 And the formation of this stratus is very
15 distinct when you look at vertical profiles of
16 temperature. So you would expect that water that is
17 released into the discharge canal, including, say,
18 liquid effluent would also be transported by this same
19 surface layer.
20 MR. TARANTINO: I would also like to take
21 this opportunity to mention that preop -- it was
22 brought up earlier today the preoperational REMP
23 program for North Anna units 1 and 2 recorded levels
24 of 250 to 300 picocuries per liter range. That was
25 documented in the preoperational REMP report.

1 So we have that data to show before the
2 units even started running. We have --
3 JUDGE KARLIN: Was that in the river, in
4 the North Anna River, at the time, where the
5 groundwater --
6 MR. TARANTINO: In Lake Anna. This is in
7 the surface water at Lake Anna. It was done as a
8 base. We talked about a baseline. That's --
9 JUDGE KARLIN: After the lake has been
10 formed but before the units began?
11 MR. TARANTINO: Before the units started
12 operating. We did a baseline. And I bring that up
13 because it was mentioned earlier, but I had a number
14 to put associated with that program.
15 JUDGE COLE: Is that plus or minus 800
16 picocuries per meter?
17 MR. TARANTINO: Not that I would. So then
18 we have this predictive modeling. And since the
19 operation of North Anna units 1 and 2, our REMP
20 measurements for tritium in the lake using the most
21 recent 5-year period again showed that 3,000 here, 49
22 picocuries per liter, which equates to approximately
23 15 percent of the EPA drinking water standard.
24 So in looking at the range, what was
25 predicted and what we are actually seeing, I believe

1 our measurements do demonstrate what the predictive
2 modeling forecasts. You know, we are in that range as
3 our actual measurements.
4 JUDGE KARLIN: And the measurements being
5 displayed or the data being displayed on slide 5 are
6 at the .3, .4 miles down from the units in the
7 treatment lagoon number 2?
8 MR. TARANTINO: Right. That --
9 JUDGE KARLIN: Where are those
10 measurements being taken?
11 MR. TARANTINO: The surface water samples
12 are taken -- I don't know the exact location, but they
13 are not right at the waste heat treatment facility
14 lagoon. I think one is by a route 208 bridge, but I
15 am not absolutely sure of the miles in sector
16 location. I can look it up.
17 Slide number 6. We talked about or have
18 talked about monitored releases and those releases
19 which we say are not expected or not intended, not
20 planned. And groundwater has not been an expected
21 release pathway at North Anna, again talking about
22 units 1 and 2 that have been in operation, and no
23 planned releases to groundwater.
24 Recognize that there has been much
25 industry operating experience published in the last

1 few years; in particular, the last couple of years and
2 we have reviewed those industry events.
3 And this purpose here of this slide is to,
4 first of all, note that we have looked at those. And
5 the ones that have been predominated have been the
6 ones dealing with spent fuel pool leakages, low-level
7 waste discharge line breaks, storage tank leakages.
8 And by reviewing those, we recognize that
9 more attention and we need to be more proactive in
10 identifying and evaluating leaks associated with
11 structures, components, and systems. So this is a
12 result of into the groundwater protection initiative.
13 But using the OE, operating events, we
14 have looked at what has been occurred at other plants
15 and what do we need to be attentive to. So that's
16 formed our beginning basis of what we are going to do
17 at North Anna.
18 JUDGE ELLEMAN: Again, before leaving
19 that, that's a rather charged sentence in the middle,
20 "Operating experience at other plants indicates the
21 need to remain vigilant." What happened at other
22 plants that causes you to say that?
23 MR. TARANTINO: The OE, in particular,
24 that I am referring to is IN2006-13, which several of
25 the Exelon plants reported tritium releases. And

1 those particular events in each of those, we were
2 talking about, just to put it into perspective, over
3 100,000 picocuries per liter or even greater than
4 that. The events associated with those particular
5 plants.
6 And I say that because based on what we
7 have looked at and continue to look at North Anna and
8 the levels that we are seeing are well even below what
9 that particular facility had seen.
10 But what it pointed out is that all of
11 these unmonitored, potential unmonitored, release
12 points, that because regulations didn't require us to
13 monitor them, that just because we didn't monitor
14 them, we wouldn't know if there was a release going on
15 or not.
16 So these OEs have said, "Okay. We need to
17 be attentive." "Vigilant" is a strong word. I would
18 rather say "be more attentive to" what is going out of
19 our plant, especially those things such as tritium,
20 that we would not be able to monitor or monitor in an
21 earlier stage, you know. We talked about that with
22 the monitoring well, something that we want to look at
23 early on as a mitigative or preventive measure. These
24 OEs have prompted us to look closer at that.
25 Next slide. So in response to the --

1 JUDGE KARLIN: So on slide number 7 now?

2 MR. TARANTINO: On slide number 7. I'm

3 sorry, Your Honor. Slide number 7. In response to

4 the experiences at the other plants, North Anna has

5 implemented a voluntary groundwater protection

6 initiative.

7 We have peripherally introduced that, what

8 I refer to as the GPI, groundwater protection

9 initiative and topic, yesterday, where some of the

10 data, the observation wells, for example, and other

11 data, has been introduced to you showing the tritium

12 measurements as well as gamma isotopic and strontium

13 measurements.

14 In particular, the tritium concentrations

15 in groundwater that we have seen from the data that

16 was presented yesterday ranged from numbers less than

17 166 picocuries per liter to the 2,080 picocuries per

18 liter.

19 You might recall that that upper bound

20 limit was one associated. We talked about the units

21 to safeguards and valve pit in that that we did get

22 levels up to that.

23 JUDGE ELLEMAN: The 166 seems to imply a

24 lower limit at detectability since it has "less than"

25 in front of it. And we heard earlier your error bar

1 is 800 picocuries per liter. Are those two things
2 consistent that you can have a lower detection limit
3 of 166 with an error bar of 800?
4 MR. TARANTINO: There again, that
5 particular result -- and I have the analytical data in
6 front of me what the error bar particular to that
7 result was. I mean, the 800 is one example of an
8 error. I don't know what the error bar was on that
9 result, but whatever equipment was used for that
10 particular sample that was analyzed for tritium was
11 capable of seeing that low of a -- so the NDC for that
12 instrument was that number.
13 JUDGE KARLIN: "NDC" being non-detectable
14 concentration?
15 MR. TARANTINO: Correct. But in all of
16 the tritium measurements that were taken of
17 groundwater, they are all below the 20,000 picocuries
18 per liter.
19 JUDGE KARLIN: And we talked about this
20 yesterday. The placement of the groundwater
21 monitoring wells, how many of them are downgrading of
22 units 1 and 2?
23 MR. TARANTINO: It is planned. They have
24 not been drilled yet. As part of the GPI, the next
25 phase is five perimeter wells initially are planned to

be drilled down gradient.

JUDGE KARLIN: But currently there are --

MR. TARANTINO: Currently there are none.

JUDGE KARLIN: Okay.

MR. TARANTINO: At this time, I would like to turn the presentation over to Mr. Smith, who will present the bounding estimates for tritium from our new units.

MR. SMITH: Again, as part of developing the early site parameter envelope, we did go to the various reactor vendors and request that they provide us input, as shown on slide number 8. And, as you can see, the number from the ACR-700, as I discussed a few minutes ago, was the most limiting one that we initially selected.

Again, we ultimately reduced the number in our plant parameter envelope to 850. And that's the value that we will have to show that we are bounded by if and when we come in for a combined license application based on the actual selection of the reactor technology and, again, beyond the selection of the reactor technology how we are going to handle and process all of the liquid waste that would result in effluents.

So these numbers that we pick from a plant

1 parameter envelope basis were designed to be bounding.
2 And we would have to demonstrate at the actual stage
3 of a COL application that we would meet those. I
4 think, as has been discussed, one of the designs that
5 we are probably paying the most attention to at this
6 point is the boiling water reactors, again, for
7 tritium, boiling water reactors, are much less of a
8 problem.
9 There is a little question --
10 JUDGE ELLEMAN: I was trying to remember
11 if any of these have operating units. The pebble bed
12 specimen, there has been an operating pebble bed?
13 MR. SMITH: Not to my knowledge, no.
14 JUDGE ELLEMAN: None of the others have
15 been operating?
16 MR. SMITH: Well, again, the ABWR, there
17 are reactors of that design in Japan, for example,
18 that are operating today. But, again, the ABWR and
19 ESPWR really are evolutions from the current boiling
20 water reactor designs that have a large operating base
21 in the United States. The AP1000, again, that's a
22 pressurized water reactor again, very similar. It's
23 a newer design but, again, in terms of this context
24 very similar.
25 The other ones listed here really are not

1 -- you know, they more are conceptual designs. I
2 think you asked the question of, you know, what is the
3 primary mechanism for creation of tritium.
4 And I think the NRC answered that quite
5 well, which is basically for a PWR reactor, that
6 primary mechanism for tritium production is the
7 boron-10 capture of a neutron --
8 JUDGE ELLEMAN: Yes.
9 MR. SMITH: -- in the reactor coolant that
10 creates tritiated water directly in the reactor
11 coolant system. In the case of a PWR once you do
12 that, again, that water is liquid tritiated water.
13 And it is very difficult, as I say, to remove that in
14 your liquid waste-processing system.
15 So once you have created it, quite
16 frankly, it is very difficult over a long period of
17 time, years since you are looking at an 11-year
18 half-life. You know, you are going to be moving
19 water, not just by leaks from the RCS, but you remove
20 water to the reactor coolant system to clean it up,
21 remove contaminants from the water, remove
22 radionuclides from the water.
23 You can remove most of those, but removing
24 the -- and you can recirculate some of that, et
25 cetera, but getting all of the tritium out is a very

1 difficult process.

2 In the case of a boiling water reactor,

3 again, they do not use the boron in the reactor

4 coolant and generally don't use very much lithium for

5 the reactor coolant either.

6 So there is very little source in a

7 boiling water reactor for the introduction of tritium

8 into the reactor coolant system, from which it could

9 get into other systems in the plant. So that is why

10 you see a very low number for boiling water reactor.

11 So if you were to hypothesize that we came

12 in with a COL application for a boiling water reactor,

13 I would very well imagine we could quite easily

14 demonstrate that tritium levels would be dramatically

15 less than the 850 curies.

16 JUDGE ELLEMAN: Do you know if the

17 operating Japanese boiling water reactors meet the 60

18 curies per year?

19 MR. SMITH: I don't know about the

20 operating Japanese reactors. I do know that, again,

21 NRC indicated I think somewhat lower numbers than the

22 60 curies is typical for a 1,000-megawatt boiler in

23 the United States. So I think there is, if anything,

24 a bit of conservatism in that number for, again, the

25 ESPWR is a somewhat larger. It's more of a

1,500-megawatt. So it's about one and a half.

So I think it is pretty consistent with the numbers that NRC mentioned in their presentation on amounts of tritium that would be produced typically in a boiling water reactor.

Again, with boiling water reactors, because you don't have boron in the reactor coolant that provides the source of tritium in the water, you see much lower numbers.

In the boiling water reactor, again, it was mentioned that a potential mechanisms is neutron absorption and deuterium. Again, boiling water reactors do use boron in control elements, but any tritium that is produced there, just like tritium that might be produced by tertiary fission in the fuel would tend to stay in the solid material where it is produced other than very small percentages that could get into the reactor coolant system and to other plant systems.

So the early site permit -- I'm on now slide 9. The early site permit analysis was originally based on this 3,100 curies per year for the ACR-700. And, again, as I say, the conservative assumption for this ACR-700 is that amount of tritium would be released and liquid effluent discharged.

1 As I mentioned earlier in further
2 discussions with AECL, if we were ultimately at some
3 point to want to evaluate that reactor further, it is
4 my opinion, professional opinion, that we could
5 potentially be able to show that the actual tritium
6 and liquid effluents would be far dramatically lower
7 than this.
8 And at COL stage, that is where you really
9 have to show that the tritium releases are indeed
10 bounding by the plant parameter envelope basis.
11 So that's I think the end of our
12 presentation. I tried not to be too repetitive with
13 the previous group of slides.
14 JUDGE KARLIN: Okay. Thank you.
15 Dr. Elleman, do you have any more
16 questions?
17 JUDGE ELLEMAN: Not at the moment, no.
18 JUDGE KARLIN: Dr. Cole?
19 JUDGE COLE: Yes. This groundwater
20 protection initiative, this will be an ongoing thing?
21 MR. TARANTINO: Yes, Your Honor. We are
22 in somewhat of infancy stage. It started in mid 2006.
23 It is evolving and will continue. And with the onset
24 of EPRI guideline being on the heels of being
25 published later this year, which will be, to the best

1 of my understanding, the driver from the NEI initial
2 initiative put out that EPRI will have this
3 publication.
4 And then we will as a utility implement
5 that. And it will be an ongoing --
6 JUDGE COLE: This would be of benefit to
7 both any proposed units also or it will be geared
8 toward 1 and 2?
9 MR. TARANTINO: No. It would be
10 applicable and can be appropriately applied to --
11 MR. SMITH: It would be applied to any new
12 units that we would employ at North Anna. We
13 certainly would take any of the information from units
14 1 and 2 and be certain that we applied similar
15 programs.
16 Beyond that -- and this is one of the
17 issues we are looking at here of attempting to put the
18 information we have learned from operating units into
19 the design of future units -- we have had a fairly
20 considerable amount of discussion about collection of
21 data, about groundwater contamination, et cetera.
22 And NRC has imposed on us a condition
23 which I agree with Judge Karlin it is a little
24 difficult to say what "preclude" means in this sense,
25 but our regulatory guidance that says that when you

1 have a sump, you want to line it; when you have tanks,
2 you don't want single wall tanks in the ground that
3 would lend themselves to the kind of leakage events
4 that some of the operating history would suggest.
5 So certainly as project director, I can
6 say we are taking those issues to heart very much in
7 terms of working with any reactor vendors out there
8 that would be potentially providing reactors for the
9 new units as well as the groundwater protection
10 initiative to be certain that if we did have something
11 that did get through those, that we would be able to
12 detect it and act upon that.
13 Again, in terms of the timing that you are
14 looking at here and siting factors, you do have a site
15 with this early site permit site where the groundwater
16 gradient is towards the lake. So by installing
17 monitoring wells, as Judge Karlin has suggested, down
18 gradient from either the existing units and/or the new
19 units, you do have sort of a final mechanism to see
20 whether or not there would be any groundwater
21 contamination that would be migrating towards the
22 lake.
23 We did do on-site measurements of soil
24 properties so that we could determine that we had
25 years between any leakage or releases, whether they

1 would be sudden or over a longer period of time,
2 between the time that they might occur and the time
3 that they could get to the lake.
4 So it is a little different. And, again,
5 there was a lot of discussion about is this an
6 accident, et cetera? It's really not an accident
7 situation. Accidents are ones where you have a
8 release that might occur and impact people in a few
9 hours where you really don't have an opportunity to
10 interdict that, react to it, and do something about
11 it.
12 For groundwater, it's quite different.
13 You do, in fact, have the opportunity to do that. And
14 we, in fact, believe on this site that we have the
15 ability to react to those types of events.
16 JUDGE COLE: Thank you. That's helpful.
17 I thought you were going to say a little
18 bit more about the model, a circulating model in the
19 lake. Were any calculations or predictions made of
20 the average residence time of a particle moving in
21 that loop?
22 MR. JHA: See, I don't happen to have that
23 model in front of me, but it's basically you are
24 solving an equation which looks at, I guess, three
25 volumes and the flow between them. And you have flow

1 in and out of the whole system. But I don't have with
2 me the rest at this time.
3 JUDGE COLE: Did the model make a
4 prediction of that? It seemed to me that it should be
5 part of the model.
6 MR. JHA: The fact that you've got the
7 flows in there and the volume, you can come up with
8 your residence --
9 JUDGE COLE: How efficient you are in
10 using the total volume in the loop. I'm sure that it
11 might be several hours, it might be several days
12 before that loop comes around, particularly if it gets
13 into a lens that doesn't utilize the whole body of
14 water.
15 DR. TAYLOR: Excuse me, Your Honor. To
16 answer your question about the residence time, I think
17 it's on the order of about a week to circulate from
18 the waste heat treatment facilities back into the
19 reservoir and back to the intake.
20 JUDGE COLE: Considering the volume in
21 that lake, that makes sense.
22 Is there a considerable portion of the
23 lake that's not involved in this loop? Is it a half
24 of the lake or is it a third of the lake? What
25 portion of the lake is not involved in the loop?

1 DR. TAYLOR: Probably about half, 50
2 percent, is not involved.
3 JUDGE COLE: So that the tritium
4 concentrations --
5 MR. SMITH: Let me clarify that a little
6 bit. And, again, I think, you know, the model that
7 we're talking about for tritium is one thing, but we
8 also did extensive thermal modeling.
9 And so one of the things you see is that
10 when the warmer water returns up lake, you have --
11 actually, beyond the point at which the plant is
12 located that warmer water tends to continue traveling
13 up lake on the surface until it cools and then
14 returns.
15 So you do, in fact, have flow mechanisms
16 beyond just the circulating flow that would be from
17 the discharge point through the waste heat treatment
18 facility through the main lake and back. But once you
19 get back to the main lake, the lake there is
20 relatively wide. That warmer layer tends to continue
21 up river, where the sensible heat is removed. And
22 then as that water cools, it then flows back.
23 So you do involve -- I would beg to differ
24 a little bit with Stu. You probably involve somewhat
25 more than 50 percent if you consider the thermal

1 modeling. I think the modeling from the point of view
2 of the radionuclide concentration buildup probably did
3 not take credit for some of that additional volume
4 that would be involved explicitly.
5 In terms of residence time, again, this
6 type of model would be looking at -- you know, you
7 have, really, two -- you have sort of an addition
8 factor, which is so many curies per year being added
9 to the system.
10 You have two removal factors. One
11 obviously is radioactive K with a 12-year half-life.
12 That's probably of lesser significance than the flow
13 through the system. In other words, the circulating
14 flow per se is now removing tritium from the system.
15 What removes tritium from --
16 JUDGE COLE: It's set by evaporation from
17 the surface.
18 MR. SMITH: It's set by evaporation, but,
19 you know, where tritium is removed, as you say, it's
20 by evaporation and it's by flow through. In other
21 words, the flow in the North Anna River obviously
22 removes tritium from that system.
23 So the residence time, again, I'm not
24 sure. It's sort of inherent to the calculation. In
25 other words, you look at the various mechanisms by

1 which tritium would be added to and removed. Implicit
2 in that would be a residence time. But I don't know
3 that we per se calculated that residence time
4 separately from the parameter of interest here, which
5 is the tritium concentration that would result from
6 this operation.
7 JUDGE COLE: Well, the incoming water
8 would usually be cooler than the water that is in this
9 circulating pattern. Would you agree with that, sir?
10 DR. TAYLOR: Yes, we would expect that.
11 JUDGE COLE: So water coming in would tend
12 to stick to the lower portions?
13 DR. TAYLOR: Yes. You would expect that
14 the inflow, which is a number that's a lot smaller
15 than the circulating water flow -- because it is
16 cooler, you would expect it to seek lower elevations
17 in the lake as the warmer water flows over it in the
18 upstream direction.
19 JUDGE COLE: All right. Thank you.
20 JUDGE ELLEMAN: Mr. Smith, you mentioned
21 that one way you would try to meet a lower tritium
22 release in a new client was through double walled
23 piping, was through liners, and para salt areas. Were
24 these comments with respect to just the
25 waste-processing system or would it be more extensive

1 than that that you --

2 MR. SMITH: Well, again, we have this

3 permit condition that NRC imposed to to, as they

4 characterize it, prevent releases of liquids to the

5 groundwater.

6 So we have to look at the regulatory

7 requirements associated with that for systems that

8 would potentially contain radioactive liquids. And

9 that will impose some fairly stringent requirements on

10 us in terms of designing a new system.

11 If there is any place that we can't meet

12 that, then we have to come back to the NRC with a very

13 detailed analysis of any area that doesn't meet that

14 and show completely acceptable results.

15 We do have to go and take that requirement

16 and implement it in the design. It is a proposed

17 license condition for our early site permit. And it

18 will require us to consider that and, really, the

19 design of any system that would have circulating

20 coolant or circulating liquids, the tanks, et cetera,

21 that would contain potentially radioactive materials.

22 JUDGE ELLEMAN: There were earlier

23 discussions about subsurface transport of radioactive

24 materials and what should be done at the ESP stage to

25 measure that. There was reference to the fact that

1 Dominion has committed to developing a transport model
2 at the OL and the COL application stage.
3 Is this a panel that can tell us a little
4 bit about what your intent is in that area?
5 MR. SMITH: I think I can comment a little
6 on that. And perhaps Stu could give you the more
7 technical details. But, you know, again, what we are
8 looking at is we did develop and derive most of the
9 parameters for such a model in the early site permit
10 stage. And I think this was discussed extensively in
11 some of the questioning prior to this.
12 But we did look at radiance of
13 groundwater. We looked at the soil parameter. I
14 think Mr. Taylor can discuss with you from yesterday's
15 slides, the parameters we looked at. But we looked at
16 most of the parameters for such a model with the
17 exception of the specific absorption coefficients for
18 individual radionuclides.
19 You know, there was a lot of discussion
20 about, well, why don't you assume a bounding value?
21 Effectively we did. The bounding value for the
22 absorption coefficients is to take no credit for it.
23 JUDGE ELLEMAN: Yes.
24 MR. SMITH: And until we have the sample
25 data that would establish what those coefficients are,

1 you know, the analysis would necessarily be based on
2 the bounding assumption that there is no absorption.
3 There was a discussion. You know, tritium
4 moves the fastest and the other radionuclides move
5 slower because they do tend to be absorbed and
6 retained in the soil.
7 So if we were to do an analysis at this
8 point in time without having specific absorption
9 coefficients for each individual radionuclide, we
10 would do it necessarily based upon the presumption of
11 no credit for those, which is the most bounding case.
12 So in terms of whether we have done the
13 investigations to meet the criteria of understanding
14 the site, in my opinion, we do. We have done those.
15 We have looked at how groundwater would be
16 transported, which direction it would go in, how long
17 it would take. We just at this point don't have the
18 details for each radionuclide for the soil conditions
19 that would look at how much additional credit you
20 would get for retaining those nuclides in the soil.
21 JUDGE ELLEMAN: Are you determining these
22 distribution coefficients an expected feature of this
23 model that will --
24 MR. SMITH: We have, in fact, collected
25 samples as part of preparing a COL application. And

1 those will be sent to -- there are few laboratories
2 that can do this because you actually have to do it
3 with actual radionuclides. You can't do this
4 measurement without introducing -- you know, it's in
5 a lab setting, but you have to introduce the actual
6 radionuclides into the soil column and measure the
7 retention and so forth.
8 And we are doing that. We have collected
9 the samples based on the fact that once you understand
10 better where the plant is going to be located, we, in
11 fact, are collecting those samples, have collected
12 those samples, and will be analyzing them.
13 In addition to that, you know, you have to
14 look at if you were to take credit for any retention
15 in backfill materials, you might decide, for example,
16 that you might not choose to take credit for
17 backfilled material, in which case I guess perhaps
18 it's not really necessary or relevant to have
19 retention coefficients for backfilled materials. But
20 if you were to take credit for that, you would have to
21 then specify the nature of those backfill materials
22 and make the same kind of measurements for them.
23 But at the present point in time, we are
24 more concentrating on the existing soils that are
25 there.

1 JUDGE KARLIN: I just had a couple of
2 questions, I think. I was asking some questions of
3 the staff panel earlier dealing with the
4 concentrations of the peak of the tritium in the waste
5 tanks, I guess it was, the releases, the discharges
6 into the heat treatment channel and then the treatment
7 facility. So I am wanting to focus on that a little
8 bit.
9 As I understand it, -- you know, let's go
10 to your slide number 4, back to 4 -- you state in that
11 and the FEIS also covers that you have a tritium
12 release of about an average of 810 curies per year of
13 the average over those 5 years.
14 MR. TARANTINO: That is correct.
15 JUDGE KARLIN: And, as I understand it,
16 that is sort of the intentional releases that you know
17 about and that you monitor and then you discharge.
18 MR. TARANTINO: That is correct, Your
19 Honor.
20 JUDGE KARLIN: And, as I understand it,
21 how that works is there are waste sumps and tanks and
22 lines within the system. And they collect water. And
23 before you discharge that water, you take a grab
24 sample and you figure out how many picocuries it has.
25 MR. TARANTINO: This gets a little bit

1 into our next topic in the sampling analysis program
2 basically for our plants, liquid and gaseous, and how
3 and where we collect the samples, what type of
4 analyses are done, including the tritium, the
5 gam-isotopic, radioiodines, particulates.
6 But essentially any monitored release from
7 the units that is managed by our procedures internally
8 that are accounted for that go in this case with the
9 liquid pathway through a discharge tunnel and
10 ultimately into Lake Anna and then ends up in the reg
11 guide 121 report. The curies that are reported in
12 that report, annual effluent release report, are the
13 result collectively of all of those things that we do
14 prior to release.
15 And that is going to be more detail
16 discussed in the next topic, but essentially that's
17 what we're doing to account for it.
18 JUDGE KARLIN: Okay. But somehow you
19 collect the tritium? And then you sample and analyze
20 it? And then you discharge it?
21 MR. TARANTINO: This is --
22 JUDGE KARLIN: Is that right or explain it
23 to me?
24 MR. TARANTINO: Well, I think maybe in
25 part. We refer to some of our samples as composite

1 samples, in which it's not just tritium alone. We may
2 be looking at the composite samples, maybe weekly,
3 monthly, quarterly. So we at a certain collection
4 point get that composite sample. And then maybe an
5 aliquot will be taken to do the tritium part. Another
6 part will have the gamma isotopic. That may be all
7 that's required for that particular sample type in our
8 liquid effluent, for example, program.
9 So that is how the sampling part of it
10 occurs as a routine release.
11 JUDGE KARLIN: Okay. But --
12 MR. TARANTINO: So we collect the sample.
13 It could be a tank or could be if some pipe could be
14 -- usually a deposit collector, a device, is used to
15 collect the sample from.
16 JUDGE KARLIN: I guess what I would like
17 to know is what are the picocurie values you find when
18 you analyze those samples for tritium.
19 MR. TARANTINO: For these types of
20 samples, our effluent samples, first of all, they are
21 reported in microcuries per ml is the standard units
22 for our effluent samples.
23 JUDGE KARLIN: Okay.
24 MR. TARANTINO: And picocuries per liter
25 is a standard used for environmental types of sample

1 analysis. So I would like to clarify that. So those
2 types of samples, we're talking about the effluent
3 samples, liquid and gaseous. When they are analyzed,
4 they will be in units of microcuries per ml.
5 JUDGE KARLIN: Microcuries per ml?
6 MR. TARANTINO: Microcuries means 10^{-6}
7 curie to give it per milliliter.
8 JUDGE KARLIN: Okay. And what are those
9 --
10 MR. TARANTINO: So then we get those
11 results. And then the --
12 JUDGE KARLIN: But you are holding me in
13 suspense. What are the values?
14 (Laughter.)
15 MR. TARANTINO: Typically they are on the
16 order of $1E^{-4}$, E^{-5}, E^{-6}.
17 JUDGE KARLIN: Now you're really messing
18 me up.
19 (Laughter.)
20 MR. TARANTINO: .000. They're very small
21 fractions.
22 JUDGE KARLIN: How many microcuries per
23 ml?
24 MR. TARANTINO: Pardon me?
25 JUDGE KARLIN: How many microcuries per

1 ml?

2 MR. TARANTINO: Talking on the order of

3 very small, very small numbers on the --

4 JUDGE KARLIN: How many picocuries? Let's

5 go back to picos because that looked like a bigger

6 number. How many picocuries? I'm trying to get a

7 comparison.

8 MR. TARANTINO: Right.

9 JUDGE KARLIN: We are talking about so

10 many picocuries in the lake and picocuries here or

11 there. And I understand that is an environmental

12 drinking water standard, but I am trying to get an

13 apples to apples comparison. So how many picocuries

14 are you finding when you take a sample of the liquid

15 you have collected in these tanks?

16 MR. TARANTINO: I would equate it to

17 picocuries per liter. We are probably looking more

18 like on the order of 100-200 net order of magnitude.

19 And I am basing that on a 11^{-6} microcurie per ml type

20 of sample result. An effluent sample typically for a

21 new client, $1E^{-6}$ microcurie per ml would give you

22 about 100, $1E^{+2}$ picocuries per liter. So I am just

23 doing a conversion.

24 JUDGE KARLIN: So you are finding 100

25 picocuries?

1 MR. TARANTINO: I am just converting the
2 microcuries per ml to a picocurie per liter for a
3 standard, a typical effluent sample type.
4 JUDGE KARLIN: So the waste that you are
5 discharging is --
6 MR. SMITH: Let me add a bit of a --
7 JUDGE KARLIN: -- a lower concentration
8 than the amount that --
9 MR. SMITH: Let me add a little
10 correction.
11 JUDGE KARLIN: Okay. Go ahead.
12 MR. SMITH: I just wanted to point out
13 that the conversion factor when you are going from
14 microcuries per milliliter to picocuries per liter,
15 there is a 10^6 factor between micro and pico.
16 There is also generally a third between
17 milliliters and liters. So the total, it's nine
18 orders of magnitude difference in the units.
19 JUDGE KARLIN: Picocuries are trillionths.
20 MR. SMITH: Trillionths of a curie.
21 MR. TARANTINO: Trillionth of a curie.
22 JUDGE KARLIN: Microcuries are millionths.
23 MR. SMITH: Millionths. But also the
24 volume you are looking at in one case is the --
25 JUDGE KARLIN: Right. How many are there?

1 How many microcuries --

2 MR. TARANTINO: So we're talking about

3 1,000, then, on the order of magnitude about 1,000 in

4 picocuries per liter.

5 JUDGE KARLIN: So the waste --

6 MR. SMITH: Well, again, let me --

7 JUDGE KARLIN: -- is 1,000 in the water

8 and the lake is 3,000?

9 MR. SMITH: It's difficult I'm sure for

10 Carl to do the math in his head.

11 (Laughter.)

12 MR. SMITH: So, you know, again, if you

13 are talking 10^{-4} microcuries per milliliter, --

14 JUDGE KARLIN: Yes.

15 MR. SMITH: -- you know, that would be 10^{5}

16 --

17 MR. TARANTINO: Plus 5.

18 MR. SMITH: -- 10^{+5} --

19 MR. TARANTINO: Picocuries.

20 MR. SMITH: -- picocuries per liter.

21 JUDGE KARLIN: Okay.

22 MR. SMITH: So that would be 100,000

23 picocuries per liter. It would be the --

24 JUDGE KARLIN: That would be the

25 conversion?

1 MR. SMITH: Conversion.

2 JUDGE KARLIN: So how many picocuries per
3 liter are being found in the waste that you sample
4 before you discharge it, 100,000 picocuries?

5 MR. TARANTINO: That would be an example,
6 typical.

7 JUDGE KARLIN: All right. Give me some
8 other examples. Presumably you collect this data all
9 the time. There must be a lot of data points. Two
10 hundred thousand? Has that been found? I mean, I
11 looked at the -- two million microcuries? Has that
12 been found?

13 MR. TARANTINO: I would say the --

14 JUDGE KARLIN: No, no. I really want to
15 know. I mean --

16 MR. TARANTINO: Right. The order of
17 magnitude that we just --

18 JUDGE KARLIN: -- you are showing me
19 something you have.

20 MR. TARANTINO: Right. The order of
21 magnitude that we just said is an example would be a
22 typical order of magnitude for liquid effluent
23 nuclide.

24 JUDGE KARLIN: This is data you should
25 readily have. How many microcuries? You take samples

1 of this waste before you discharge it into the lake.
2 I want to know what your picocurie concentration is.
3 You take lots of samples. So what is the
4 range? Tell me the range: the maximum and the
5 minimum.
6 MR. LEWIS: Judge Karlin?
7 JUDGE KARLIN: Yes?
8 MR. LEWIS: Mr. Tarantino is not the
9 person who normally takes these measurements. He's
10 involved with REMP development and reporting. I do
11 have Mr. Breeden here, who can answer those specific
12 questions about what is actually measured in these
13 samples.
14 JUDGE KARLIN: All right. Yes. Why don't
15 we have him come up? If he can speak to this issue,
16 I would appreciate it. If you could raise your right
17 hand, sir?
18 (Whereupon, was duly sworn.)
19 JUDGE KARLIN: Great. Thank you. Please
20 sit down and identify yourself.
21 MR. BREEDEN: My name is James Breeden.
22 I am a health physicist at North Anna Power Station
23 and previously was supervisor, Radiological Analyst,
24 which meant I was in charge of both the effluent
25 program and the environmental program.

1 JUDGE KARLIN: All right. Great. My
2 question, then, is the same one. How many picocuries
3 per liter of the range that you see when you take
4 samples of the waste water before it's discharged?
5 MR. BREEDEN: It will vary typically on a
6 monthly average between about 100,000 picocuries per
7 liter up to probably a max of about 10 million
8 picocuries per liter.
9 JUDGE KARLIN: Okay. Thank you for a
10 straight answer there, but they said you are the guy
11 who knows the information. So that is what we needed.
12 Is anything done to treat that effluent before it's
13 discharged to remove the tritium?
14 MR. BREEDEN: The tritium is in the form
15 of water. It cannot be removed. It will process
16 through with the rest of the water. You can remove
17 the particulates and the iodines. You cannot remove
18 the tritium.
19 To give you an idea of the dilution water
20 we are talking about, our discharge is a maximum of
21 300 gallons a minute. And typically it's about 180
22 gallons per minute.
23 Our dilution water associated with that is
24 a minimum -- and this is only in the winter -- of
25 about 327,000 gallons. Typically our dilution water

1 will run between 654 and about 2 million gallons.

2 JUDGE KARLIN: So the answer is no?

3 MR. BREEDEN: Correct.

4 JUDGE KARLIN: No treatment is discharged.

5 Would it be possible to suck it up like into a truck

6 and to dispose of it in some other way, in some other

7 place?

8 MR. BREEDEN: You could suck it up into a

9 truck, but then wherever you take it to, whatever you

10 do with it, you are going to be releasing it in the

11 form of either liquid water or water vapor generally.

12 And what that means is you are either going to have a

13 liquid release at some other location or you are going

14 to have a gaseous release at some other location.

15 JUDGE KARLIN: What is the volume we are

16 talking about of this waste water?

17 MR. BREEDEN: I don't have that off the

18 top of my head.

19 JUDGE KARLIN: Okay.

20 MR. BREEDEN: Typically I'm thinking --

21 and this is just ballpark numbers -- probably about,

22 I would say, on the order of a million or two million

23 gallons per month.

24 JUDGE KARLIN: Okay. I think that answers

25 my question. Let's see. I think that's all I have.

1 JUDGE ELLEMAN: When you say nothing can
2 be done, you could, of course, solidify so it's an
3 absorbed hydrate in a compound, but the cost is just
4 prohibitively expensive for --
5 MR. BREEDEN: Yes. I mean, there are
6 processes that you would use.
7 JUDGE ELLEMAN: Yes.
8 MR. BREEDEN: And the prices, I've seen
9 them range over 500, --
10 JUDGE ELLEMAN: Yes.
11 MR. BREEDEN: -- you know, 250 to 500
12 dollars per gallon tritiated water.
13 JUDGE ELLEMAN: Yes.
14 JUDGE KARLIN: When you have got something
15 that was 10 million picocuries, depending on the
16 volume, do you ever think about treating it in that
17 way, rather than discharging into the lake? I
18 understand it's a lot of dilution, but if you've got
19 something that's pretty concentrated, why don't you
20 deal with it, rather than releasing it?
21 MR. BREEDEN: We have not looked at it
22 because it is not cost-effective. And even at the
23 highest levels we look at, we are still within
24 regulatory limits.
25 JUDGE KARLIN: Do you mean by

1 "cost-effective" it has cost money and otherwise you
2 can still comply with the regs? Would it be
3 reasonably achievable for you to take the highly
4 concentrated -- well, not highly concentrated.
5 I take that back. It sounds like a high
6 number. It really isn't that high of a number. Ten
7 million picocuries is ten million trillionths, is it
8 not? So it's still pretty danged small.
9 MR. BREEDEN: Correct.
10 JUDGE KARLIN: But it sounds large. And
11 is there any possible ALARA where you could take that
12 depending on the volume and treat it in some way,
13 rather than releasing it?
14 MR. BREEDEN: Well, you have to remember
15 that ALARA includes a cost-benefit. And the cost in
16 treating water at that level is relatively little for
17 the benefit, the dose reduction, that you get for
18 releasing it.
19 You know, when you look at the difference
20 in doses, it's relatively small because tritium has a
21 very small dose factor. Your largest dose factors
22 come from the removal of the iodines and the cesiums.
23 If you can pull them out, that is the most significant
24 portion of your dose.
25 Keeping them down keeps your dose down

1 significantly. And then all of your dose contribution
2 that you see, well, not all of it but a large portion
3 of it, is due to tritium, which it takes a large
4 amount of tritium to produce a significant dose, which
5 I think Carl will be addressing later.
6 JUDGE KARLIN: Okay. Thank you. That was
7 helpful.
8 Anything else? Yes. Did you have some
9 clarification, anyone?
10 MR. TARANTINO: Well, I just wanted to add
11 a point to our -- this is on the mitigation side and
12 what we can do along the lines of your questioning.
13 Back in the late '80s and the early '90s, information
14 notice from the NRC for looking at systems that are
15 typically nonradioactive but licensees to look at --
16 and we looked at this thoroughly.
17 The nonradioactive systems, how there
18 might be potential opportunities for another system to
19 get contaminated or to become radioactive, in other
20 words, so a system that you might think is clean,
21 condensate polishing building or turbine building, for
22 example. We looked at those systems. This is well
23 obviously before the GPI.
24 So I just wanted to share that with you,
25 that we were doing those types of things several years

1 ago in response to the information notice. It was
2 91-40. And I think that is important because the GPI
3 prompted us to go back and look at those, but we
4 already had that done.
5 JUDGE KARLIN: Okay. Thank you.
6 Are there any other clarifications that
7 you would like to make or, Mr. Lewis, any questions
8 you would like to ask?
9 MR. LEWIS: I would like to ask just a few
10 follow-up questions. I believe Mr. Tarantino
11 testified that the measurements of tritium that have
12 been taken as part of the GPI in the wells and the
13 sumps and valve bit have been below the levels, the
14 concentrations of tritium in lake water.
15 Just throwing out to the panel, is lake
16 water used around the plant in non-nuclear systems?
17 MR. TARANTINO: Yes, it is. And, Your
18 Honor, the lake water is introduced into fire main
19 lines, hoses that are used at North Anna Power
20 Station. So essentially that lake water is used.
21 MR. LEWIS: And is that lake water system
22 ever used in areas for cleaning vehicles or washing
23 other things down?
24 MR. TARANTINO: Yes, it is.
25 MR. LEWIS: So it is possible that levels

1 of tritium don't just reflect the concentrations of
2 the lake? You know, it could occasionally be
3 detectable in samples around the plant?
4 MR. TARANTINO: That is correct.
5 MR. SMITH: Another example I would add to
6 the use of lake water, when we did the core boring
7 campaign looking at removing samples of the rock and
8 soil samples, when you do that drilling operations,
9 you need a working fluid. And typically we used,
10 those core boring campaigns used, lake water. So that
11 is another mechanism by which some amount of lake
12 water can be introduced into groundwater.
13 JUDGE KARLIN: Along that question, if I
14 may, the issue came up, do you know whether any of the
15 water in Lake Anna is used for a source of drinking
16 water?
17 MR. SMITH: I can answer the question, but
18 the lake water itself is not used directly for
19 drinking water. I think, as Ken Jha can explain if
20 you would like, we did assume for dose calculation
21 purposes that it was. So, Ken, do you want to kind of
22 clarify the assumption that was made versus, again --
23 JUDGE KARLIN: Well, that's fine. I just
24 wanted to know the actuality of the --
25 MR. SMITH: Downstream there may be, you

1 know, Hanover County or somewhere downstream, there
2 may be, places that some amount of Lake Anna water
3 ultimately would end up in some drinking water
4 environment, but from the lake itself, the answer is
5 no.
6 JUDGE KARLIN: Because, you know, strictly
7 speaking, we have been focusing on the EPA's drinking
8 water standard, but that only applies to drinking
9 water by definition. And if it's not drinking water,
10 there is no legal requirement, actually, to apply it.
11 MR. SMITH: But, again, the practice is,
12 even though it's not used for that purpose, the
13 practice, at least from a dose analysis viewpoint in
14 terms of the impact of routine releases, is to assume
15 that it is.
16 JUDGE KARLIN: Yes. Okay. All right.
17 Mr. Lewis, anything else?
18 MR. LEWIS: Just a couple of more
19 questions. I believe that there was a statement that
20 none of our currently monitored wells are downgrading
21 with the existing units. And I wanted to make sure
22 that was correct. It was my impression that actually
23 the REMP well 01A is literally downgraded but maybe
24 not in an optimal position to --
25 MR. TARANTINO: Okay. When I answered

1 that question, I was thinking in terms of for the ESP,
2 down gradient wells for that purpose. Our one REMP
3 well, which is station 01A, a metrology lab on site
4 there, that is part of the REMP program. And that is
5 down gradient from the --
6 JUDGE KARLIN: Is that one we talked about
7 yesterday?
8 MR. TARANTINO: Yes. It was one of them.
9 JUDGE KARLIN: Is that 12 or is that
10 something else?
11 MR. TARANTINO: It was depicted on the
12 busy graph, the color-coded. And it was shown below
13 units 1 and 2 but also --
14 JUDGE KARLIN: To the side?
15 MR. TARANTINO: -- to the side. Yes,
16 right.
17 JUDGE KARLIN: Okay.
18 MR. HINTZ: You get a cross-gradient to
19 the units 1 and 2, down gradient of the ESP site.
20 JUDGE KARLIN: Right. Okay. Yes.
21 MR. TARANTINO: Yes. My previous response
22 in the paper clarifying that was in response to the
23 ESP.
24 MR. LEWIS: Finally, Mr. Hintz, you
25 mentioned, I think, as part of the groundwater

1 protection initiative that five wells are being
2 installed. I just want to clarify those five wells
3 are being installed for the existing units right now,
4 as part of the protection initiative for the existing
5 units?
6 MR. HINTZ: That is correct.
7 MR. LEWIS: And our plan and commitment is
8 that when additional units are added, we would also
9 extend the initiative to existing units and add
10 further wells?
11 MR. HINTZ: You are correct.
12 MR. LEWIS: And in adding those additional
13 wells, we would evaluate the potential location of
14 sources and the directions of flow from those sources
15 and try and put wells in locations that would provide
16 prompt detection capability. Is that correct?
17 MR. HINTZ: Absolutely.
18 MR. LEWIS: That's all I had.
19 JUDGE KARLIN: Okay. Thank you.
20 JUDGE ELLEMAN: I've thought of a question
21 I would like to ask.
22 JUDGE KARLIN: Sure.
23 JUDGE ELLEMAN: You recently supplied us
24 with additional analytical results on the tritium.
25 And this was in response to our question 48 that we

1 had submitted. You gave us some new and updated
2 numbers. In looking at those numbers, it looks like
3 the highest measured tritium level occurs in the U-2
4 valve pit. And I think those numbers are on the order
5 of several thousand picocuries per liter. We can
6 probably find them to look at them, but I don't need
7 to look at them for the question.
8 I had two questions. One is, would that
9 source of tritium be included in your measured
10 component of tritium or is that one that would bypass
11 the waste collection system and not be included?
12 MR. BREEDEN: The unit 2 valve pit sump is
13 a radioactive sump that pumps to a system. And it's
14 part of our normal discharge pathway. So that is a
15 monitored, sampled, and reported pathway.
16 JUDGE ELLEMAN: Okay.
17 MR. BREEDEN: And what we were doing, that
18 was part of our groundwater initiative. We went into
19 sumps. That sump I think is about 40 feet below
20 grade. And we went in there specifically to collect
21 samples looking to see if we had leaks anywhere.
22 And that particular sample -- and I don't
23 know which number you are particularly interested in
24 on that, but we found levels of tritium. We proceeded
25 to sample the water in the sump, the water leaking

1 from the wall, and the water that was coming in right
2 at about 20 feet above the sump level. That was where
3 we found the 20/80, the highest value we saw of true
4 groundwater.
5 There are several samples listed on there,
6 I believe. Let's see. What have we got? I've got to
7 find the actual number, 28. Unit 2 valve pit
8 groundwater. Yes. That number, 20/80, that is the
9 groundwater leaking into that vaulted area above the
10 sump itself. So that is the value for the groundwater
11 that we found.
12 JUDGE ELLEMAN: Okay. So the tritium,
13 then, potentially didn't come from leaking valves that
14 was in that pit. It came external to that valve pit
15 into the valve pit?
16 MR. BREEDEN: Correct. And the level we
17 saw was at 20/80. And what we don't know given a
18 level that is that low, it is not indicative
19 necessarily of a "spent fuel pit leak," which will run
20 in the hundreds of thousands. This could be
21 indicative of a fire main leak or service water leak,
22 where we have got lake water that is leaking into the
23 ground and we're detecting it as it moves into that
24 sump area.
25 MR. SMITH: And I think at this point

1 wouldn't it be at 40 feet below the surface, probably
2 aren't you at the lake level?
3 MR. BREEDEN: Yes. Hydraulically we're
4 probably right about at lake level. And next, where
5 that sump is, right next to it is what we call the mat
6 sump. It is specifically designed. It's four pumps,
7 two for each unit. They're specifically designed to
8 draw groundwater out from under containment mat.
9 Part of what that may create is a
10 hydrological sink, where as that groundwater is pulled
11 out, lake water is infiltrating into the groundwater
12 and moving opposite of a typical gradient when those
13 pumps cut on.
14 So part of what the five wells that we're
15 putting on in on site between the down gradient from
16 unit 1 or 2 is to determine, part of what it will help
17 determine, is is that sump area acting as a
18 hydrological sink pulling lake water into and
19 underneath the plant.
20 MR. HINTZ: I'll clarify. That's
21 conjecture at this point. We really haven't analyzed
22 it from a hydrogeological standpoint. But it's a good
23 assumption to make at this point.
24 MR. BREEDEN: Yes. It's what the wells
25 will help us to determine is which way is the flow.

1 JUDGE ELLEMAN: So the current lake
2 concentration is indeed high enough that it could
3 logically be the source of the 2,000 picocuries?
4 MR. BREEDEN: Yes. That is a possibility.
5 Just to give you an idea, the OEs we looked at,
6 typical spent fuel pit contamination might would run
7 in the tens of thousands, up to 100,000 picocuries per
8 liter contamination in the groundwater. And we are
9 looking at on the order of call it 2,000 and lower.
10 So right now we are saying we don't have
11 a significant problem. We have got indications. And
12 we are trying to put in wells and stuff to help us
13 determine what those indications mean.
14 JUDGE ELLEMAN: Okay. That's all.
15 JUDGE KARLIN: Thank you. All right.
16 Well, thank you all very much for your time and
17 testimony.
18 (Whereupon, the witnesses were excused.)
19 JUDGE KARLIN: And what we will do is take
20 a break now for lunch. And when we reconvene, I guess
21 we'll be turning to the radiological, routine release
22 radiological, subject with the staff presenting their
23 witnesses first.
24 We show 12:38 on the clock back there, I
25 think, if I can make it out. An hour and 15 minutes.

1 I would rather cut this a little shorter, rather than
2 make it longer. So let's say we reconvene -- sorry
3 for the awkward time -- at 10 of 2:00. Can we do
4 that? So that will give us about an hour and 15, and
5 we can still get going. Ten of 2:00. Thank you. We
6 are adjourned.
7 (Whereupon, a luncheon recess was taken
8 at 12:38 p.m. until 1:50 p.m.)
9 JUDGE KARLIN: On the record. Mr. Court
10 Reporter, we're on the record now please. Again, this
11 is the afternoon of what, the 25th of April. We're
12 again reconvening the evidentiary hearing in the
13 matter of Dominion Nuclear North Anna LLC's
14 application for an early site permit. We are now
15 proceeding to a topic, I guess, what is it, Topic 4
16 that we had outlined in our March 20th order and
17 Radiological Releases and Doses From Normal Operations
18 was the nominal title we put on that. We'll proceed
19 with the staff witnesses. I note that Mr. Dehmel and
20 Mr. Stoetzel, I hope I got the pronunciation right.
21 How is it?
22 MR. STOETZEL: Stoetzel.
23 JUDGE KARLIN: Stoetzel.
24 MR. STOETZEL: Yes.
25 JUDGE KARLIN: You've already been sworn.

1 So without doing it again, I'll just remind you you're
2 still under oath and we can proceed on that basis.
3 Okay?
4 MR. STOETZEL: Understood.
5 JUDGE KARLIN: Great. We look forward to
6 your presentation on the subject.
7 MR. STOETZEL: Good afternoon. My name is
8 Greg Stoetzel. I work with Pacific Northwest National
9 Laboratories and I'll be sharing this presentation
10 with Mr. Jean-Claude Dehmel with the NRC staff.
11 Our presentation will consist of the
12 review of current radiological environment around the
13 North Anna site, a review of current regulations
14 related to radiological releases and doses to the
15 public. Mr. Dehmel will be presenting this topic and
16 we'll also review the fluent release source terms,
17 exposure pathways and provide a review of the dose
18 estimates that were done as part of the environmental
19 impact statement and also the safety evaluation report
20 and we'll look at, talk about certainties and dose
21 estimates and then finally discuss the overview of the
22 radiological, environmental monitoring program.
23 Slide 3, a radiological, environmental
24 monitoring program has been conducted around the North
25 Anna Power Station since 1976. A preoperational

1 program sampled various media and environment to
2 establish a baseline to determine the magnitude and
3 fluctuation of radioactivity in the environment once
4 the units began operation. The preoperational
5 monitoring program included collection and analysis of
6 samples of air particulates, precipitation, milk,
7 crops, soil, well water, surface water, fish and silt
8 as well as measurement of ambient gamma radiation.
9 Modifications to the monitoring program
10 are made based on changes in the areas such as milk
11 production, changes in agricultural use and changes in
12 lake use. Results of the program are summarized in
13 the Licensee's annual radiological, environmental
14 operating program report and results of the Licensee's
15 effluent monitoring program are summarized in their
16 annual radiological fluent release report.
17 The data and analysis in these reports
18 show that the doses to the maximally-exposed
19 individual around the North Anna Power Station were a
20 small fraction of the limits specified in the Federal
21 Regulations.
22 Now Mr. Dehmel will provide a review of
23 regulations related to radiological releases from
24 normal operation.
25 MR. DEHMEL: Thank you. My name is Jean-

1 Claude Dehmel. I'm a Health Physicist with the U.S.
2 NRC and I am responsible for preparing the section,
3 Section 11 of the SER addressing liquid and gaseous
4 effluence in associated doses.
5 This portion of this presentation provides
6 an overview of regulation addressing the presence of
7 radioactive materials and liquid and gaseous
8 effluence. The important regulations are 10 CFR Part
9 20, Standards for Protection Against Radiation, and 10
10 CFR Part 50, Appendix I, entitled Numerical Guides for
11 Design Objectives under the Limiting Conditions for
12 Operation to Meet the Criterion as low as is
13 reasonably achievable for radioactive material in
14 light water, cool nuclear power effluence.
15 Of these slides, five merit specific -- Of
16 these requirements identified here, five merit
17 specific attention. The first one is Section 20.1301
18 and 20.1302 which require nuclear power reactors to
19 comply with the annual dose limit of 1 millisievert or
20 100 millirem to members of the public, an effluent
21 concentration limit in Table 2 of Appendix B to 10 CFR
22 Part 20.
23 The second one addresses Section 20.1301
24 which requires nuclear power reactors to comply with
25 the EPA's radiation protection standard in 40 CFR Part

1 190. This standard limits the annual dose to a member
2 of the public to less than or equal to 25 millirem to
3 the total body or any organ except for the thyroid
4 which is limited to less than or equal to 75 millirem.
5 In next two slides in addition to this
6 one, the focus is on the requirement of 10 CFR Part 50
7 which control doses to an hypothetical maximally-
8 exposed member of the public living near a nuclear
9 power plant. The first elements are identified with
10 50.34(a) and 50.36(a). 50.34(a) addresses the
11 requirements for equipment and procedures to control
12 effluent releases. 50.36(a) addresses technical
13 specification for the purpose of managing and
14 controlling and monitoring effluent releases. The
15 other elements of Appendix to Part B the GDC criteria
16 at 60, 61 and 64 you can see they are all related to
17 the control and monitoring of all effluents.
18 Slide 7, this focuses on the numerical
19 guides and design objective of Appendix I. The key
20 two sections of Appendix I in here are Section (2)(a)
21 which defined the design objectives of the doses for
22 liquid effluence and Sections (2)(b) and (2)(c) which
23 defines design objective for -- effluence. The other
24 one addresses operational element implementation of
25 the program.

1 Slide 8 addresses the operational effluent
2 control program with the focus on two major documents.
3 The first one is the offsite dose calculation manual
4 which describes the method for controlling releases
5 through the radiological effluent technical
6 specification or what is also known as the standard
7 radiological effluent controls in estimating doses to
8 the public and the radiological environmental
9 monitoring program which describes the types of
10 environmental samples and analysis conducted to assess
11 radioactivity and radiation levels in the unrestricted
12 area.
13 The third bullet, program requirement
14 guidance, simply outlines that it's not complete by
15 all means. The major documents which the NRC provides
16 as guidance for the purpose of preparing the tech
17 specs, the offsite dose calculation manual, the
18 radiological, environmental monitoring program and so
19 on. And the last bullet identifies record keeping
20 requirement mainly under Part 20, subpart M, Sections
21 50.72, 50.73 and Part 50.75(g) which we talked about
22 this morning.
23 This last slide provides a recap of all
24 the applicable regulations that are cited in Part 20
25 or Appendix I. So this is essentially the recap of

1 all the dose limits that we have talked about this
2 morning with one exception which we don't listed there
3 is 40 CFR 141 and the reason that it's not listed here
4 is that 40 CFR 141 is not cited as a requirement of 10
5 CFR Part 20. It is cited in a tech spec as a
6 requirement, but it's not cited in 10 CFR Part 20.
7 JUDGE COLE: Do you think that's just an
8 oversight?
9 MR. DEHMEL: I don't know. This was --
10 The regs. were established a long, long time ago
11 before I came to the NRC. I do not have an answer.
12 JUDGE KARLIN: So the 10 CFR -- I'm sorry,
13 40 CFR 141 is the drinking water standard.
14 MR. DEHMEL: That's correct.
15 JUDGE KARLIN: And that's not a
16 requirement of the NRC, but it is a tech spec that the
17 NRC by staff guidance imposes I guess.\
18 MR. DEHMEL: Yes, it's imposed on the
19 operator. When they actually look, they determine how
20 much radioactivity has been discharged into the
21 environment. They have to look and assess the dose on
22 a monthly basis and make a determination whether or
23 not it could or could not exceed the requirements of
24 40 CFR Part 141. So it's imposing the tech spec.
25 JUDGE KARLIN: Okay.

1 MR. DEHMEL: And just briefly in
2 calculating doses, we used two major computer codes
3 and Greg will talk about this a little bit later. But
4 to calculate doses from liquid effluence, we used the
5 computer code called LADTAP II which is described in
6 your SER 413 and to calculate doses from gaseous
7 effluent we use a computer code called GASPAR II which
8 is described in NUREG CR 46.53.
9 Now Mr. Stoetzel will complete the rest of
10 the presentation.
11 MR. STOETZEL: Slide 10 provides
12 information on the PPE liquid and gaseous effluent
13 source term as well as information on the liquid
14 effluent source term and the gaseous effluent source
15 term. We discussed those earlier this morning in our
16 presentation on tritium.
17 Slide 11 lists the exposure pathways
18 considered by the staff and the Applicant as part of
19 our evaluation. It includes direct radiation exposure
20 in liquid pathway and the gaseous exposure pathway.
21 Doses, the liquid pathway doses were
22 calculated on a per unit basis by Dominion and the
23 staff using as Jean-Claude just mentioned for the
24 liquid pathway, we used the LADTAP II computer program
25 for activities, for the following activities, eating

1 fish and invertebrates caught near the discharge
2 point, for drinking water from Lake Anna and for
3 boating, swimming and use of shoreline for
4 recreational purposes.
5 The doses estimated using the, we used the
6 PPE source term as we discussed earlier as an input
7 into the computer program. Other parameters used as
8 input included the effluent discharge rate, the
9 dilution factor for discharge and transit time to the
10 receptor locations and that information was found in
11 the Applicant's environmental report. The staff
12 reviewed the parameters for reasonableness and the
13 staff's dose estimates were -- We did independent dose
14 estimates and compared those to the Applicant and to
15 the 10 CFR Part 50 Appendix I design objectives.
16 This table on Slide 13 presents the liquid
17 pathway doses to the maximally-exposed individual on
18 a per unit basis. The maximum annual total body dose
19 was estimated to be about 0.8 millirem per year which
20 compares to the design objective of 3 millirem per
21 year and the dose to the maximum organ dose was 2.5
22 millirem per year and that compares to the design
23 objective of 10 millirem per year.
24 Slide 14, doses to the maximally-exposed
25 individual from reactor gaseous effluence were

1 calculated on a per unit basis using the GASPAR II
2 computer program. Doses were calculated for the
3 following locations: the near site boundary, the
4 nearest vegetable garden, the nearest resident and the
5 nearest meat cow. Doses from the milk pathway were
6 not calculated as there were not milk cows or goats
7 located within a five mile radius of the ESP site.
8 Other inputs to the program included meat
9 and vegetable production rates, atmospheric dispersion
10 factors, ground deposition factors, receptor locations
11 and consumption factors and this information was
12 provided by the Applicant in their environmental
13 report. The staff, again similar to the liquid
14 pathway, we reviewed the input parameters for
15 reasonableness and did an independent calculation of
16 the doses and also we did one other thing. We
17 estimated the doses, as I mentioned earlier, from
18 tritium release from the Unit 3 wet cooling tower.
19 And doses were compared to 10 CFR Part 50 Appendix I
20 design objectives.
21 JUDGE ELLEMAN: Before you leave that
22 slide, on the maximally-exposed individual, you
23 presume, don't you, that this individual is moving,
24 that whatever is the maximum exposure point downwind,
25 he is moving around to that point to get the maximum

1 possible exposure? Is that correct?

2 MR. DEHMEL: No. That individual is

3 fixed. That's a point that's identified as part of

4 the land use census that the licensee or the applicant

5 would determine and based on land use census, the

6 nearest resident is identified as a potential

7 maximally-exposed individual and then the calculations

8 simply consider the fact that you might have an adult,

9 a teenager child and an infant there and the doses are

10 done as a matter of fact for that location. So it's

11 not a moving location.

12 JUDGE ELLEMAN: It's not.

13 MR. DEHMEL: No, it's not. It takes into

14 account first is it the nearest location beyond the

15 plant boundary and usually the answer to that is yes.

16 JUDGE ELLEMAN: Okay.

17 MR. DEHMEL: And then it takes into

18 account atmospheric dispersion and the position at

19 that point. So when the activity is assumed to be

20 discharged, the calculations simply assume that for

21 that calculation, this is a source term that goes into

22 the direction and then with the following chi/q and

23 d/q, the atmospheric dispersion and the position

24 parameter, here are the resulting doses. So it's not

25 a moving target.

1 JUDGE ELLEMAN: But now if it were a
2 moving individual, if there was some case that a
3 person who is moving around a boundary, then he would
4 presumably be able to get a higher exposure, would he
5 not?
6 MR. DEHMEL: Moving around the boundary,
7 do you mean just outside the fence?
8 JUDGE ELLEMAN: Yes. Moving around the
9 public access point would be --
10 MR. DEHMEL: But there is a separate
11 calculation that addresses doses at an EAB.
12 JUDGE ELLEMAN: Yes.
13 MR. DEHMEL: So there is a separate,
14 similar calculation being performed for doses at an
15 EAB and they only involve exposure from the plume and
16 the direct radiation and inhalation whatever that may
17 be. And again, the EAB location is selected on very
18 specific site conditions. The dose receptor may be
19 moving only in the context that after the result of
20 the land use census are evaluated, then a
21 determination is made to confirm that is this current
22 maximally-exposed individual still the current one or
23 should that designation be assigned to another
24 location.
25 JUDGE ELLEMAN: Okay. But now the plume

1 is moving over time, is it not? It depends on wind
2 conditions.
3 MR. DEHMEL: That's correct.
4 JUDGE ELLEMAN: And it will shift around
5 to the boundary, but yet you are focusing just on what
6 is the maximally-exposed point for these calculations.
7 MR. DEHMEL: Because that location is
8 either closest to the plant or it has the worst
9 atmospheric dispersion or deposition parameter.
10 JUDGE ELLEMAN: Okay.
11 MR. STOETZEL: This table presents the
12 dose estimates to the maximally-exposed individual
13 from the gaseous effluence from one proposed unit.
14 The doses from tritium released from the Unit 3 wet
15 cooling tower that we discussed this morning did not
16 contribute significantly to the dose. The doses from
17 that pathway were less than 10 percent of the dose
18 from the reactor gaseous effluence which are shown on
19 this slide.
20 JUDGE KARLIN: And this is slide?
21 MR. STOETZEL: This is Slide 15.
22 JUDGE KARLIN: Fifteen for the record.
23 MR. STOETZEL: Doses at the site boundary
24 were well within the Appendix I design objectives that
25 were discussed earlier. The design objectives are 10

1 millirad per year, gamma in the air 20 millirad per
2 year, beta in the air 5 millirem per year dose to the
3 whole body and 15 millirem dose to the skin. In
4 addition, the dose to the thyroid was within the 15
5 millirem per year design objective.
6 In summary, estimated doses to the
7 maximally-exposed individual per unit were within the
8 10 CFR Part 50 Appendix I design objectives. In
9 addition, estimated doses from the liquid and gaseous
10 effluence to the maximally-exposed individual at the
11 site boundary from the both the current operating
12 units and the two proposed units were well within the
13 regulatory standards of 40 CFR Part 190 and those
14 limits are to the whole body 25 millirem per year and
15 the calculated dose per unit was 6.8 millirem per
16 year. To the thyroid, the 40 CFR Part 190 limit is 75
17 millirem per year and the estimate was from one of the
18 units was 27 millirem per year.
19 I'm sorry. That's for the whole site.
20 Let me correct myself. That's for the whole site.
21 These doses are for in comparing 40 CFR Part 1990 it's
22 for the whole site, for Units 1 and 2 and the proposed
23 units.
24 JUDGE KARLIN: Would you double-check
25 that? We had a question no. 85 in our safety

1 inquiries. You might look at that on this subject
2 and it says, "The SSAR refers to Table 5.4-11." That
3 table is a table in the SAR, I think. It specifies
4 that the total radioactive effluence from the plants
5 will produce a 6.4 millirem and that the total from
6 the existing units is 0.32 millirem. So is the 6.4
7 the total from all four plants or units or is it from
8 the two additional units?
9 MR. DEHMEL: No, Your Honor. This is
10 different. The difference in that you're referring to
11 the ER in question 85. Is that right? Let me go back
12 to it. Bear with me for a moment. Let me find
13 question 85.
14 JUDGE KARLIN: I'm referring to the staff
15 safety evaluation report, safety, supplement.
16 MR. DEHMEL: Right. We did not consider
17 the contribution of the existing plants.
18 JUDGE KARLIN: Okay. So --
19 MR. DEHMEL: And the doses on per unit
20 basis addressed in --
21 JUDGE KARLIN: Okay. I see.
22 MR. DEHMEL: That's why the results that
23 Mr. Stoetzel is presenting are quite different than
24 the ones presented and discussed in the SER.
25 JUDGE KARLIN: Well, let me just say that

1 this shows whole body 6.8 millirem per year on this
2 slide that you're showing right now. Right?
3 MR. DEHMEL: Right.
4 JUDGE KARLIN: Now that's for all four
5 units?
6 MR. STOETZEL: That's correct.
7 JUDGE KARLIN: Okay. And let's go back to
8 question no. 85 where we are quoting from the
9 supplemental safety evaluation report which refers to
10 Table 5.4-11 which is from, I believe, the Applicant's
11 SAR and that table as we had it specified that the
12 total radioactive effluence from the plants will
13 produce a total of 6.4 millirem per year and then it
14 refers to existing units of 0.32 millirem per year.
15 If you add those two together, you get 6.8.
16 MR. STOETZEL: That's correct.
17 JUDGE KARLIN: Am I reading that right?
18 MR. STOETZEL: Yes.
19 JUDGE KARLIN: Okay. Well, the question
20 we asked at that time and I'll ask it again as I
21 understand it, the existing units' total dose to the
22 maximally-exposed individual is 0.32. From the
23 proposed insight, it's 6.4 millirem. That's 20 times
24 higher. The existing unit is at a certain level and
25 the proposed two new units will be 20 times higher

1 than the existing level of radiation released. Why is
2 it 20 times higher? Haven't we learned anything in 20
3 years?
4 MR. STOETZEL: It has to do with the
5 conservatism in the PPE source term that we used. They
6 assumed certain leakage factors from the fuel that are
7 higher than you would see during normal operation
8 unless the source term is higher. We used as higher.
9 That's one of the sources of why the doses are higher.
10 JUDGE KARLIN: So it is 20 times higher
11 than the existing units.
12 MR. STOETZEL: I don't know the exact --
13 I didn't do that comparison.
14 JUDGE KARLIN: Could you look at that
15 section of the documents and confirm that 6.4 millirem
16 versus 0.32 millirem sounds like 20 times --
17 MR. STOETZEL: Okay. Yes, and I thought
18 you were talking about the source term, the actual
19 release source term. The doses are, yes, roughly 20
20 times.
21 JUDGE KARLIN: And that's because of PPE's
22 conservatisms.
23 MR. STOETZEL: Right.
24 JUDGE KARLIN: And this covers a number of
25 possible units.

1 MR. STOETZEL: Right.

2 MR. DEHMEL: The other thing is that there
3 are some -- For example, the dilution afforded by the
4 discharge canal, my understanding is that the way it
5 was structured in the application they applied a more
6 conservative dilution than actually occurs in the
7 discharge canal. So you have two things essentially
8 competing to tend to increase the dose as well as
9 overly assertive assumptions when compounded together
10 gives you this dramatic discrepancy which in fact are
11 really an artifact of the way PPE source term is
12 structured and some of the major assumptions made in
13 the model that essentially had a direct contribution
14 on the dose results.

15 JUDGE KARLIN: Well, we call the 6.4
16 millirem additional contributions 20 times higher and
17 that's a result of being conservative, conservative in
18 the sense that's the maximum amount that they can
19 expect to be emitting or that you calculate will be
20 emitted from this site. Is that right?

21 MR. STOETZEL: Right. Using the PPE
22 source term, right.

23 JUDGE KARLIN: But it's not really
24 conservative in the sense that if you want it to
25 tighten the health standards, you might say let's make

1 it lower than that. The lower number would be more
2 protective of human health and the environment,
3 wouldn't it? Instead of 6.8 or 6.4, what if you had
4 3.2? That's more conservative, more protective, isn't
5 it?
6 MR. DEHMEL: It is, but in this case --
7 JUDGE KARLIN: You mean worst case
8 assumptions on the PPE which resulted in higher --
9 MR. DEHMEL: To broaden the envelope.
10 Right.
11 JUDGE KARLIN: To broaden the envelope.
12 MR. DEHMEL: So this way the Applicant has
13 a lot more flexibility as to what kind of design, what
14 kind of rad waste system.
15 JUDGE KARLIN: Right. It gives the
16 Applicant more flexibility but it causes more
17 pollution to be allowed to go into the environment.
18 MR. DEHMEL: Not necessarily because you
19 could look at the existing operating history of Units
20 1 and 2 and they are well below, based on this number,
21 well below the Appendix side criteria.
22 JUDGE KARLIN: Right --
23 MR. DEHMEL: So you could say the results
24 show based on current practices at the plant it's a
25 small fraction of the Appendix I dose limits.

1 JUDGE KARLIN: Well, I'm trying to look at
2 what's as low as reasonably achievable and it seems
3 like the existing units are achieving 0.32 and yet the
4 proposed units are going to be allowed to get 20 times
5 higher than that. Is that as low as reasonably
6 achievable?
7 MR. DEHMEL: No, we're not saying they're
8 going to be allowed to be 20 times. What we're saying
9 is --
10 JUDGE KARLIN: Sure you are. That's the
11 plant parameter outlet. If they can meet that,
12 they're as good as gold.
13 MR. DEHMEL: But it's in compliance with
14 the existing regulation.
15 JUDGE KARLIN: But is it ALARA given that
16 the existing unit is 20 times less?
17 MR. DEHMEL: But that's a determination
18 that the Applicant will have to make under -- Yes,
19 when the seal --
20 JUDGE KARLIN: Don't you make that?
21 You're the regulator.
22 MR. DEHMEL: But I don't. You see in the
23 PPE concept I don't know what kind of rad waste system
24 they're going to have. It's not described. This
25 number, the source term, is simply a source term, a

1 best estimate, that the Applicant has estimated. For
2 us to do the requirement of Section (2)(d) of Appendix
3 I, it requires us to know what kind of technologies
4 are going to be designed and implemented and whether
5 or not our dose technology is sufficient to actually
6 meet the ALARA philosophy of Appendix I. We're not
7 in that position to do that now. We just don't have
8 the information.
9 JUDGE KARLIN: Okay. Please continue when
10 you're ready.
11 MR. STOETZEL: Slide 17, the NRC
12 regulations have no required or recommended level of
13 statistical reliability associated with the
14 determination of cumulative dose. The staff's
15 interpretation of 40 CFR Part 190 is that it does not
16 specify a level of statistical reliability other than
17 a provision allowing various instances where the
18 limits of 40 CFR Part 190 are exceeded.
19 The sources of uncertainty, some of the
20 sources of uncertainty and dose estimates, are the
21 source term itself as we were just discussing and
22 atmospheric dispersion factors, the liquid dilution
23 flow which we were just discussing a little bit before
24 the fact that in our calculations and the ones that
25 Dominion did in their environmental report and they

1 used a dilution flow of 100,000 gallons per minute and
2 in the existing unit, that's considerably higher and,
3 I think, this morning in their discussion they were
4 talking about 600,000, even higher than that. So the
5 100,000 gallons per minute that was used in the
6 evaluation as part of the EIS is conservative from
7 that standpoint. And then another source of
8 uncertainty is the food chain transport values that
9 are used in the model. In Reg. Guide 1.109, those
10 values that are also used as part of the LADTAP and
11 GASPAR computer codes that were used to calculate
12 doses.
13 The staff evaluated the health impacts
14 from routine, gaseous and liquid effluence from the
15 proposed nuclear units in the North Anna site. Based
16 on the information provided by Dominion and in its own
17 independent evaluation of the staff concludes that
18 there will be no observable health impacts to the
19 public from normal operation of the proposed units and
20 the radiological impacts would be small and mitigation
21 is not warranted.
22 Slide 19, radiological monitoring, the
23 staff reviewed the documentation on the Licensee's
24 radiological environmental monitoring and also their
25 offsite dose calculation manual and we reviewed recent

1 monitoring reports and determined that the current
2 operational monitoring program is adequate to
3 establish the radiological impacts to the environment
4 related to construction and operation of the proposed
5 units on the North Anna ESP site. That concludes our
6 formal presentation.
7 JUDGE KARLIN: If I may on that slide, the
8 current EP program adequate for new units, we were
9 going through the groundwater monitoring, a discussion
10 of whether or not monitoring of the groundwater for
11 unplanned releases would be appropriate and in
12 September of '06, the NRC issued a lessons learned
13 report and urged that groundwater monitoring or
14 methods be employed to monitor groundwater. In light
15 of that, are you still saying the current groundwater
16 -- the current program is adequate for the new units
17 when they're not monitoring for groundwater?
18 MR. STOETZEL: The EIS was written -- When
19 the EIS was written, it's kind of was like a snapshot
20 in time. It was issued last December and we had --
21 the information we had at the time was from the
22 radiological environmental monitoring program. We
23 reviewed those reports and based on that we feel that
24 the program is adequate.
25 The Licensee has described their

1 groundwater protection initiative that they're in the
2 process of developing and implementing. I would
3 expect that as a result of the data that they gathered
4 during that program that there may be changes to their
5 radiological environmental monitoring program that
6 would include perhaps some of those wells.
7 JUDGE KARLIN: Well, if I was the
8 applicant and I read that slide from the regulator, my
9 regulator being the NRC, and it says current program
10 adequate, I'd say, "Well, I'm not going to do this new
11 initiative. It's going to cost me money. Why don't
12 I just stop it because they're telling me what I'm
13 doing is fine?"
14 MR. DEHMEL: I would like to clarify
15 something in that context. It's clear from the task
16 force report that there were some weaknesses that were
17 identified. There are 26, I believe, recommendations
18 that were made by the task force and those
19 recommendations are being identified for different
20 work groups and the Agency as we speak is working on
21 those recommendations, trying to figure out whether or
22 not the guidance needs to be improved, the regulations
23 need to be changed and so on.
24 For us at this point, the technical staff,
25 the only thing we have is the SRP, the reg. guide and

1 all those requirements. We cannot on our own even
2 though it may be optimally better to include some
3 elements, we cannot on our own impose requirements
4 that are above and beyond what the guidance says for
5 the staff to do.
6 JUDGE KARLIN: Right.
7 MR. DEHMEL: So you have to understand
8 that we're the technical staff. We don't make those
9 management decisions and there is another nuclear
10 licensing group, rulemaking group, in the NRC who is
11 tackling these kinds of issues.
12 JUDGE KARLIN: I understand that and
13 there's something going on to tackle those issues.
14 But if you're speaking as an expert with opinions as
15 to radiological monitoring programs, one would think
16 that when you present a slide like that, a current
17 program is adequate, you're not saying the management
18 says it's adequate. You're saying I as an expert
19 believe that this radiological monitoring program is
20 adequate. And you're saying that in light of the fact
21 that the Agency itself and this report came out and
22 said there needs to be this kind of groundwater
23 monitoring and the Applicant itself is saying it's
24 going to implement this additional monitoring and that
25 the EPRI said you need to additional groundwater

1 monitoring. But you still think in your professional
2 opinion they don't need to any of that stuff.
3 MR. DEHMEL: I said this in a professional
4 opinion because I have certain regulatory tools in
5 front of me. I cannot on my own say even though the
6 regulations or the guidance states this, the staff
7 might, myself or whoever is working on this licensing
8 case. We want to impose the following additional
9 requirement. We just don't have the liberty to do
10 this.
11 JUDGE KARLIN: So what you mean is as far
12 as your opinion is that it complies with the
13 regulations as they exist now.
14 MR. DEHMEL: Correct and that's the only
15 thing that I have before me.
16 JUDGE KARLIN: Okay.
17 MR. DEHMEL: So my profession opinion
18 essentially is anchored into the guidance that we
19 have.
20 JUDGE KARLIN: Yes.
21 MR. DEHMEL: It's not my own professional,
22 personal opinion which doesn't matter in this case.
23 JUDGE KARLIN: Well, it might, but we'll
24 let it go at that.
25 (Laughter.)

1 JUDGE KARLIN: Thank you. Dr. Elleman,
2 did you?
3 JUDGE ELLEMAN: Yes. I'll ask some
4 questions. As you're aware, we submitted a
5 considerable number of questions to you which you
6 diligently responded to and sent answer back to us and
7 as sometimes happens, this produces additional
8 questions when you get the answers back because
9 sometimes you don't quite understand what the answer
10 says or it gives you additional insights. So some of
11 the things I would pursue are in that category and
12 they're things that have been triggered by answers you
13 gave us to earlier questions.
14 One of the questions that we had asked is
15 in developing chi/q values for exposures of
16 populations during airborne radioactivity, we
17 attempted to ask what plank conditions did you assume.
18 What percent failed fuel and what were leakage rates
19 in the system? And the responses we got back to those
20 said that this is not the way it's approached. The
21 way it is approached is to look at industry experience
22 on average and use that as the guide for exposures to
23 general populations.
24 And, for example, let's see, the answer to
25 our Safety Question 30, you had said in response from

1 the NRC, said "The methods used to derive
2 radioactivity levels and primary coolant and primary
3 steam numbers are based on relationships that reflect
4 the operating experience of the industry for BWR and
5 PWR plants." And the answer to our Safety Question
6 73, this was reiterated. The response said, "The
7 estimates of radioactive materials discharged into the
8 environment represent total aggregates without
9 specifying fractional releases by building vents such
10 as plant stacks spent fuel building, rad waste
11 building, etc. Could you help give us some insight
12 into how is this done? How is this aggregated
13 industry experience used to come up with the predicted
14 chi/q values, the predicted exposures to people in the
15 general population?
16 MR. DEHMEL: Okay. Clarification. The
17 information that you referred to in Questions 30 and
18 75, I believe, do not --
19 JUDGE ELLEMAN: Seventy-three.
20 MR. DEHMEL: Seventy-three, sorry. Do not
21 address those. I understood the question to mean what
22 was the basis, what were the underlying assumption
23 developed under the source term. So I thought that in
24 the context of your question that only addressed
25 essentially you wanted to hear more information

1 elaborating on the PPE concept. In other words, where
2 was -- how did the Applicant and the staff confirm a
3 PPE value so these radionuclides were consistent?
4 So basically when we say "in the
5 aggregate" in calculating the source term, once you
6 know a specific type of plant, there are some computer
7 codes that are used. One is GALE Code for PWR, a GALE
8 Code for BWR. The built-in values in a GALE Code
9 reflects the early operational history of a fleet of
10 reactors, meaning that from the type of reactor, the
11 type of fuel, that based on the performance of plants
12 then that if you had so many microcuries or so many
13 curies of radioactivity in the primary coolant, you
14 would expect some activity to be available for release
15 either in liquid or gaseous effluence. That's what
16 I'm referring to.
17 JUDGE ELLEMAN: Yes.
18 MR. DEHMEL: So the thing that -- The only
19 thing we could do with respect to the PPE concept is
20 we recognize that I believe four of the designs are
21 essentially conceptual designs. There is no operating
22 history or no real information available. But there
23 were three that were available meaning the AP 1000,
24 ABWR and ESPWR.
25 So what was done there was to go back to

1 the DCD, the design control documents, that support
2 those designs both as final for the ABWR and the AP
3 1000 in a draft form for the ESPWR. In looking at
4 these documents, you can find out the Applicant for
5 the DCDs, lo and behold, used the NUREG, the GALE
6 Code, in that sense to actually devolve or evolve for
7 an estimate of source term that may be released in
8 liquid and gaseous effluence. So basically, the
9 derivation of the source term that may be released in
10 essence reflects the operational history of what we've
11 had in the past.
12 They factor, for example, that the thermal
13 power is different. There may be some different types
14 of systems that are used to mitigate the amount of
15 radioactivity that may be release. For example,
16 different ion exchange columns raise different types
17 of decontamination factor. Gaseous effluence may be
18 mitigated by other methods. So those were plugged in
19 into the Code and they came up with source term, both
20 liquid and gaseous, that may be released on a yearly
21 basis.
22 So by us, the staff, going back to those
23 document, the DCD, and determining how the source term
24 was derived, we were able to make the link back to the
25 GALE Code. The Rosetta Stone of this business is that

1 that's where the information comes from. And
2 essentially understand that some adjustments were made
3 because at that particular point in a DCD, they're
4 able to actually say we're going to have this step for
5 waste processing system. We're going to have this
6 kind of mitigating measures on gaseous effluence and
7 confirm that those were generally consistent with NRC
8 guidance in how to calculate these doses, I mean, the
9 source term, I'm sorry, the source term. Now that's
10 what goes out the stack or goes out the discharge
11 pipe.
12 The chi/q in this case, the long-term
13 annual average that the Applicant has calculated is
14 based on actual MET (phonetic) data. So we simply
15 took those values as constant because this reflects
16 site-specific conditions. So we did not --
17 JUDGE ELLEMAN: No.
18 MR. DEHMEL: There was somebody that
19 looked at it -- Let me say this. Someone else in our
20 group looked at those numbers making sure they were
21 adequate, but we, the staff, in calculating the doses
22 both for the SER and for the EIS, we used those values
23 that were provided.
24 JUDGE ELLEMAN: Okay. I was really in
25 error in mentioning chi/q values. What I'm really

1 wanting to understand is the dose calculations that
2 employ the chi/q values that also have source term
3 associated with them. I have heard you say that there
4 was a fleet of reactors that was referred to and that
5 was used to get some averaged or maximal --
6 MR. DEHMEL: Not --
7 JUDGE ELLEMAN: No?
8 MR. DEHMEL: No, not doses. When I say
9 that, it's only for the source term.
10 JUDGE ELLEMAN: Okay.
11 MR. DEHMEL: Meaning that you have so many
12 microcuries of cobalt-60 iodine or whatever in a
13 primary coolant and then based on what we know about
14 this fleet of operating reactors that once you have
15 that kind of concentration in a primary coolant, you
16 would expect that kind of activity released. This has
17 nothing to do with the dose yet. In other words, it's
18 one component.
19 JUDGE ELLEMAN: It's one component of the
20 calculation.
21 MR. DEHMEL: Right. Absolutely.
22 JUDGE ELLEMAN: I want to focus just on
23 that component for the moment.
24 MR. DEHMEL: All right. So you have three
25 components. One is the source term, how was it

1 derived.

2 JUDGE ELLEMAN: Yes.

3 MR. DEHMEL: The second one is how was it

4 transferred, transmitted, released into the

5 environment and the third one is the dose receptor.

6 Right?

7 JUDGE ELLEMAN: Right. Okay.

8 MR. DEHMEL: So the first one is only

9 associated with the source term.

10 JUDGE ELLEMAN: That's what I want to talk

11 about.

12 MR. DEHMEL: Okay. There is no dose

13 component there. There's no chi/q there.

14 JUDGE ELLEMAN: No, it's a contributor to

15 the dose calculation.

16 MR. DEHMEL: It's the major element, the

17 dose calculations.

18 JUDGE ELLEMAN: Yes. Okay. All right.

19 Now help me better understand how this database from

20 the fleet of reactors was used to come up with an

21 appropriate source term for the general public dose

22 calculations.

23 MR. DEHMEL: Again, it's used by looking

24 at the input parameters that are required in the Code

25 and only, for example, you have to specify the power

1 level, the kind of waste treatment you're going have,
2 the kind of out-gas treatment system you might have
3 and so on and then you plug all this information in
4 the Code. What the Code relies on --
5 JUDGE ELLEMAN: I'm afraid you've already
6 moved further down the line in the discussion for me.
7 You have a group of reactors that are exhibiting a
8 range of performance characteristics. The reactors
9 are releasing different amounts of radioactivity
10 because they're reflecting different operating
11 conditions. Correct so far?
12 MR. DEHMEL: Yes, I understand where we're
13 not communicating here.
14 JUDGE ELLEMAN: Yes. Okay. Help me out
15 here.
16 MR. DEHMEL: When I said a fleet of
17 operating reactors, that relationship is only there
18 for the purpose of determining if you have power plant
19 operating at 3300 megawatt thermal and you have 1
20 microcurie of activity and it's a PWR or BWR in the
21 coolant, this is what you would expect to be released
22 out of the stack. There's no dose there. No dose.
23 It's just a source term.
24 JUDGE ELLEMAN: No, it's just a source
25 term. Okay.

1 MR. DEHMEL: Source terms. So what the
2 Agency did in developing those two, the GALE Code and
3 BWR Code, they looked at this information in the
4 aggregate for each type of plant and say, "Well, we
5 understand that there are some outliers." But a good
6 relationship, for example for cobalt-60, if you have
7 so many microcuries of cobalt-60 in the primary
8 coolant, you might expect 0.0111 microcurie out in the
9 effluent. So using this information, they actually
10 constructed a generic, in essence, relationship
11 between expected coolant activity and what you would
12 expect to see going out into the environment. That
13 then becomes the source term on which the
14 radionuclides are essentially scaled up or down
15 depending on the other input parameters.
16 For example, if the analysis was done on
17 a 3,000 megawatt power plant in a NUREG in a GALE Code
18 and you had a plant that was 3,800, what they
19 obviously would factor is the fact that you have a
20 higher thermal power output. Therefore, there should
21 be corresponding increases in the source term. Right?
22 JUDGE ELLEMAN: Sure. You would just
23 scale it in accordance with the parameters.
24 MR. DEHMEL: You would scale it up.
25 Right. And then the other parameters with respect to

1 the kind of process systems that are used to treat
2 liquid effluence and gaseous effluence, how much is
3 being discharged, what fraction of the primary coolant
4 in that specific effluence stream and so on, these are
5 all site-specific or plant-specific parameters that
6 are applied. The way the Code is set up, they have
7 some default values. So an applicant could use the
8 default values or could apply their own.
9 JUDGE ELLEMAN: Okay. Unfortunately, I'm
10 getting too much information here to process in one
11 short period of time. Let's focus on cobalt. You
12 used cobalt-60 as an illustration.
13 MR. DEHMEL: As an example.
14 JUDGE ELLEMAN: Let's focus on that.
15 Let's say I have 18 reactors in my fleet of reactors
16 I'm looking at. They are all in different operating
17 conditions. They are all releasing somewhat different
18 quantities of cobalt-60 into the environment as a
19 source term from each of those specific reactors.
20 Okay?
21 MR. DEHMEL: This is possible. Yes.
22 JUDGE ELLEMAN: All right. Now how did
23 you go from that measurement to coming up with the
24 value you're going to use in your calculational input
25 for determining the cobalt-60 source term in your

1 evaluations?

2 MR. DEHMEL: That analysis was done in

3 support of the development of the computer code and

4 basically, what the staff did with contractors, they

5 looked at specific information from different power

6 plants.

7 JUDGE ELLEMAN: Okay.

8 MR. DEHMEL: And established this

9 relationship. It's not the relationship that the code

10 user can change. They are hard-wired into the

11 computer code. But that initial relationship as to

12 what would be a good relationship for the cobalt-60 in

13 a different effluent stream, that was carefully

14 evaluated with the data and available information

15 about operating plant characteristics. For example,

16 they would look at the kind of fuel, fraction to fail

17 fuel and so on. So they took all that into

18 consideration and then somebody made a wise decision

19 that said, "Well, for PWR, here are the ratios."

20 JUDGE ELLEMAN: Okay. It's the wise

21 decision part that I want to talk about here. I want

22 to know how they made this wise decision. In my 18

23 reactors, one of them is releasing more cobalt-60 than

24 any of the others, let's say. Is that the value that

25 is used in the input or is it an average of all of

1 those that was used?

2 MR. DEHMEL: I'm sorry. I cannot answer

3 this question. This Code was developed in the late

4 '70s and I just do not have -- There is information in

5 NUREG 0016 and NUREG 0017. If you're interested you

6 can look at this. There are essentially the default

7 values and in the second part of the documents, it

8 says "basis" and it provides some text and some

9 information as to what is the basis for those first

10 set of default values that you see in the first part

11 of the NUREG and that's the extent that one can derive

12 from the NUREG. I just cannot go beyond that.

13 JUDGE ELLEMAN: Okay. Now in this

14 calculational source term that was used, do you

15 believe it represents the worst possible case of the

16 surveyed group of reactors that was studied or does it

17 represent something less than the worst possible case?

18 MR. DEHMEL: We know that -- We suspect,

19 I shouldn't say know, that operating reactors today

20 perform a lot better than the data on which this

21 computer code has been based.

22 JUDGE ELLEMAN: Okay.

23 MR. DEHMEL: Fuel performance has greatly

24 improved.

25 JUDGE ELLEMAN: Yes.

1 MR. DEHMEL: Much better cladding design.
2 Nuclear power plants are much more attuned in
3 maintaining the proper plant chemistry and that's
4 reflected over the years. We can see doses to
5 radiation work going down, effluent releases going
6 down. So there's a whole trend of improvement.
7 So based on that alone, I can say that my
8 professional judgment is that --
9 JUDGE KARLIN: No, you aren't allowed to
10 get into your professional judgment is. Just what the
11 regs.
12 (Laughter.)
13 JUDGE KARLIN: No, go ahead.
14 MR. DEHMEL: Duly noted. The NUREG says.
15 JUDGE KARLIN: Okay.
16 MR. DEHMEL: The NUREG says that those
17 were the conditions and conditions have improved since
18 then.
19 JUDGE ELLEMAN: I would agree.
20 MR. DEHMEL: Based on looking at gaseous
21 effluent annual, I mean, the annual effluent release
22 report.
23 JUDGE ELLEMAN: Okay. You, I gather,
24 aren't sure whether they in effect averaged the
25 performance of this test group of reactors or took the

worst case or how they analyzed it to come up with, say, the cobalt-60 part of the source term.

MR. DEHMEL: Some numbers -- I mean, you could look at these two NUREGs. Some were averaged. Some there was some simple statistical analysis that they had done and I don't know.

JUDGE ELLEMAN: Different approaches.

MR. DEHMEL: Different approaches, yes, because these are very complex mechanism. In those days, every plant was essentially very unique.

JUDGE ELLEMAN: Yes.

MR. DEHMEL: They were not standardized. So they had to take that into consideration. It was really a complex task, a complex effort, to sort this out and come up with kind of a unifying theory of what happens with radioactive effluence at a nuclear power plant.

JUDGE ELLEMAN: Okay. All right. Let me move onto something else here. On the response to our Environmental Question 44 related to liquid pathway and gaseous pathway exposures for Units 1 and 2 for four selected years and when I looked at those values, I noted that the ranges of values ranged over a factor of 25 for gaseous exposures and over a factor of two to liquid exposures over these four year periods.

1 What can explain this large a variation year to year
2 in exposure of values?
3 MR. STOETZEL: For the liquid exposure
4 pathway, this morning I believe the Licensee was
5 talking about how certain years more the units are in
6 outage or something, so they may have less liquid
7 effluent releases that year if one is in an outage.
8 JUDGE ELLEMAN: Yes.
9 MR. STOETZEL: If they're at full power,
10 they may have more. So there would be a difference
11 from a standpoint of the operation of the units and it
12 would be the same thing for the gaseous pathways, the
13 gaseous exposure pathway releases. Some years, they
14 have an outage. Some years they may be both operating
15 more than other years.
16 JUDGE ELLEMAN: So outage activities are
17 the main explanations for this wide disparity. I
18 don't know this question is maybe best directed to
19 Dominion people, but I want to hear your perspective
20 on it.
21 MR. STOETZEL: That's my perspective on
22 it.
23 JUDGE ELLEMAN: Thank you. Yes, maybe the
24 same kind of explanation exists for the relationship
25 between -- Well, though I don't think it would

1 seemingly do it. It appears from data that we were
2 sent by you in response to Question No. 44 of our
3 environmental questions that there doesn't appear to
4 be a linear relationship or something that looks like
5 a linear relationship between released radioactivity
6 and dose.
7 For example, in the year 2005, 180 curies
8 of gaseous radioactivity was released to produce a
9 total body dose of 0.0018 millirem per year. In 2001,
10 460 curies produced a dose of 0.046 millirem per year
11 and that's a total body dose that's 25 times the value
12 in 2005. But what can explain these kinds of
13 disparities in the numbers?
14 MR. STOETZEL: I think I can't -- I don't
15 have a specific answer for you other than the fact
16 that the doses are shown here, the calculated doses,
17 are very, very low.
18 JUDGE ELLEMAN: Yes.
19 MR. STOETZEL: And you're talking about
20 2001 0.046 millirem is a very low dose. It's not a --
21 JUDGE ELLEMAN: Is it -- Do you think
22 another possible explanation that some of these data
23 are in error or do you think that's unlikely based on
24 your experience?
25 MR. DEHMEL: We're not going to speculate

about this.

JUDGE ELLEMAN: Yes.

MR. DEHMEL: I think you're best bet on this one is to the Applicant to explain those results.

JUDGE ELLEMAN: Okay. Maybe that's a good question to put to them.

MR. DEHMEL: Right. We just cannot.

JUDGE ELLEMAN: We also received in response to our Safety Question 86 at Attachment B that gave more detailed information and this is relevant to the staff's calculation of the data in Tables 5.4-6 through 5.4-10 to check Dominion's calculation in order to get an independent check of the Applicant's number. And in looking at that attachment, there are some things that I didn't understand well and I thought maybe you could help me out.

One place where I had trouble is you would calculate -- I'm looking here at computer printout tables and it is possible that I'm not understanding what is represented. But I'm looking at the first page in Attachment B, attachment to NRC staff's response to Question 86 and the next to the last column here in this table appears to be a comparison of the ratio of your calculated value to the value

1 calculated by Dominion.

2 JUDGE KARLIN: Wait a second. Do you all

3 have that document in front of you?

4 MR. DEHMEL: I'm trying. You're referring

5 to --

6 JUDGE ELLEMAN: Yes. Maybe I'd better

7 give you time to look for it.

8 MR. DEHMEL: Well, I have the attachment

9 or I have the exhibit. The question is it's

10 essentially -- It's the first one after this one.

11 (Indicating)

12 JUDGE ELLEMAN: It's the first page after

13 the covering three sheets and at the top, it doesn't

14 have a label or -- It has four boxes that say

15 "discharge gallons per minute," "volume gallon per

16 year," "dilution factor 1,000," "number of plants..."

17 It's related to your analysis.

18 MR. DEHMEL: Yes. So the values you see

19 there are 100, $5.26E^7$, 1,002. Is that what you see in

20 those boxes?

21 JUDGE ELLEMAN: I suspect. Let's look at

22 the very first line for tritium and look at the very

23 first entry number.

24 MR. DEHMEL: Okay.

25 JUDGE ELLEMAN: The one I'm looking at it

1 reads 5.5 X 10^{-6}.

2 MR. DEHMEL: Right.

3 JUDGE ELLEMAN: Is that what you're

4 looking at?

5 MR. DEHMEL: Yes.

6 JUDGE ELLEMAN: Okay. So I think we're

7 looking at the same table. The next to the last

8 column strikes me as a comparison between what you got

9 and what Dominion got and some of these numbers differ

10 rather significantly. For example, carbon-14, the

11 ratio is 1.8. You got 80 percent more than they did.

12 For --

13 MR. DEHMEL: I'm sorry. It's the

14 opposite. It's the ER value, the submitted value as

15 compared to the NRC's. It's divided by the NRC value.

16 JUDGE ELLEMAN: Okay. So I had it

17 backwards. They would have had the higher value.

18 MR. DEHMEL: Yes, they had some higher

19 estimates which I did not question.

20 JUDGE ELLEMAN: Thank you. I stand

21 corrected. For iron-55, it's 50 percent difference.

22 Over on the next page for rhodium-106, it's a factor

23 of 100 difference. The ratio is 2 X 10^{-2}. What I'm

24 leading up to is what do you when you have those large

25 of differences in your calculations. How did you

1 resolve those disparities?

2 MR. DEHMEL: The last column, the last two

3 columns, really are for my own internal use. Let me

4 point out the really important columns in this

5 spreadsheets. It's the Part 20 compliance flag and

6 the ratio of the concentration and those essentially

7 are the very important columns because they are the

8 ones that determine compliance with 10 CFR Part 20.

9 So if you look at concentration ratio of concentration

10 of the limit, meaning the concentration that were

11 estimated by the Applicant versus the NRC limit of 10

12 CFR Part 20, those ratios have to be less than 1

13 obviously and then the sum of ratios always has to

14 less than one.

15 JUDGE ELLEMAN: Yes. And in terms of

16 complying with the requirements, that's the important

17 column. Right?

18 MR. DEHMEL: That's right. And then the

19 next column says "Compliance Flag" and it passes that

20 criterion for each one and collectively for the sum of

21 the ratio. So those are the important ones.

22 JUDGE ELLEMAN: Okay. I would concur with

23 you. Those are the most important, but in the text,

24 you make statements that you checked the Applicant's

25 calculations and you checked them for the following

1 figures and we asked for that check and that's what
2 these documents are and in looking at the check, it
3 looks like in the instances I've cited and possibly in
4 other places too, you didn't agree with them.
5 MR. DEHMEL: Yes. To some --
6 JUDGE ELLEMAN: And I'm wondering what
7 happens when that's the case.
8 MR. DEHMEL: That's correct. In some, you
9 can see they estimated more activity than we would
10 have postulated.
11 JUDGE ELLEMAN: Yes.
12 MR. DEHMEL: And in others where they are
13 under. Now with respect to the value for RU-106 in
14 catching the -- I can't give you an answer right now.
15 I would have to go back to my notes and see whether or
16 not -- Well, either two things happened. It's that I
17 looked at it and said, "Fine. I'm not going to worry
18 about it" or I have a note somewhere that says, "This
19 is different because... and it's acceptable."
20 But the last two columns are really for me
21 to troubleshoot to give me a sense of direction as to
22 how does the Applicant estimate compared to the ones
23 that we calculated internally ourselves. That's
24 really the purpose of this. The most important set of
25 results is whether or not it's in compliance with Part

1 20. That's really the important one.

2 JUDGE ELLEMAN: Okay. So you did not try

3 to resolve then the reasons for the disparity between

4 you and the Applicant in these cases.

5 MR. DEHMEL: Not at that level of detail.

6 JUDGE ELLEMAN: Okay.

7 MR. DEHMEL: Because by far, you can see

8 that in all these instances it's well within the

9 requirements of Part 20. In some cases, the Applicant

10 has a tendency to overestimate what the staff has

11 estimated. So I just did not agonize over this given

12 that this is the PPE concept again.

13 JUDGE ELLEMAN: Okay. Let's talk about

14 that point you just made as being well within the Part

15 20 requirements. I am interpreting the third column

16 from the right as being the fraction of allowed

17 concentration that are based on Part 20 requirements

18 that you have determined for the isotope. Am I

19 correctly understanding what that column is?

20 MR. DEHMEL: Yes.

21 JUDGE ELLEMAN: Okay.

22 MR. DEHMEL: You will see that to the left

23 of that is a column entitled "Part 20 Compliance Flag"

24 and then to the left of that, there's another column

25 that says "Ratio Concentration Divided by the Limit."

1 Those two columns, the first one that says "Ratio of
2 the Concentration Over the Limit" is my own estimate.
3 Based on that, I have a compliance flag with Part 20.
4 But the one that says "North Anna ESP Table 547
5 Fraction" there I want to see what the Applicant had
6 listed in Table 547 of the ER and in Tables 137 and
7 138 of the SSAR. I wanted to confirm that those
8 numbers were matching.
9 JUDGE ELLEMAN: Okay. And so those are
10 the Applicant's calculations in that column the third
11 from the right?
12 MR. DEHMEL: They are results. Correct.
13 JUDGE ELLEMAN: They are results.
14 MR. DEHMEL: They are results and it was
15 a comparison between the two.
16 JUDGE ELLEMAN: Okay. What you said about
17 the numbers being comfortably below the limits is
18 certainly true for most isotopes.
19 MR. DEHMEL: It's true for all of them.
20 JUDGE ELLEMAN: But it's not true for all
21 of them.
22 MR. DEHMEL: No, it is true for all of
23 them.
24 JUDGE ELLEMAN: No. What about cesium-
25 137?

1 MR. DEHMEL: If you look at a ratio, the
2 most important ones, the ones calculated by the staff,
3 is headed "Ratio Concentration Divided by Limit."
4 There's not a single value there that's above one. In
5 fact, the sum of the ratio applying the unit rule of
6 Part 20, the sum of the ratio is 0.428. So each
7 radionuclide is less orders of magnitude below
8 Appendix B, Table 2 concentrations for liquid effluent
9 and you sum up all fractions to comply with the unit
10 rule in Part 20. That sum of all these ratios is less
11 than one.
12 JUDGE ELLEMAN: That sum, that part I
13 would agree with. But I'm still hung up on the fact
14 that it looks to me like cesium-137 is 12 percent of
15 the allowed limit based on the Applicant's calculation
16 if I'm looking at the value for cesium-137. If I'm
17 looking for xenon-137, it's 23 percent. If I'm
18 looking at rhodium-106, that one is indeed -- I don't
19 know why I flagged that one. That's low. But, yes,
20 they don't in all cases look to be extremely below the
21 limits. Is that correct?
22 MR. DEHMEL: Again, those results aren't
23 the facts of the assumption made to develop the PPE.
24 If you assume a very large PPE source term for liquid
25 and gaseous effluence, well, lo and behold, you would

1 expect you have more effluence going on in the
2 environment and therefore the concentration, the
3 apparent concentration, based on this construct would
4 also be higher.
5 So it's true those are high and we already
6 know from the dose calculations that what actually
7 happened in practice, in reality, the doses are not
8 orders of magnitude, but a factor of 20 or so lower in
9 actual operation than they are postulated to be here
10 because of the PPE source term concept because here
11 we're trying to maximize. So if you postulate a very
12 high source term for liquid and gaseous effluence, the
13 end result had better be a higher concentration in the
14 environment. Correct?
15 JUDGE ELLEMAN: Yes. Correct.
16 MR. DEHMEL: So that's what's happening
17 here. This is again the logical extension of assuming
18 a very large PPE source term for both liquid and
19 gaseous effluence.
20 JUDGE ELLEMAN: I'm getting from your
21 comments that there is such much conservatism in the
22 source term that you are not concerned by the fact
23 that the calculated values do indeed appear to be
24 close to the allowed level. Is that what I'm hearing?
25 MR. DEHMEL: That's correct.

1 JUDGE ELLEMAN: Okay.

2 MR. DEHMEL: I would have had a problem
3 had any one of these numbers be one or higher because
4 then if you apply the sum of ratio, they would fail.

5 JUDGE ELLEMAN: Yes.

6 MR. DEHMEL: They would fail. Right? So
7 the question is as long as each ratio is less than one
8 and when you sum them up, you pass the unity, then as
9 far as I'm concerned it meets the requirement. That's
10 it.

11 JUDGE ELLEMAN: Yes.

12 MR. DEHMEL: So if the Applicant came with
13 the sum of the ratio of 0.999, it's good.

14 JUDGE ELLEMAN: Okay. I had another
15 question related to these tables. Your first two
16 columns, one of them is headed "Existing Plants" which
17 I assume to be Units 1 and 2. The other is "New
18 Plants" and the -- Let's see here. Maybe I'm -- Okay.
19 All right. I think maybe I have been trapped into the
20 fact that there are different units on those columns.

21 MR. DEHMEL: That is correct.

22 JUDGE ELLEMAN: I was going to question
23 why the numbers are numerically so different, but I
24 guess I just answered by own question, didn't I?

25 MR. DEHMEL: It's the correct

1 interpretation. We tried to obtain the information on
2 a curie per year basis, but the Applicant said we can
3 only give you concentrations. So what we did was take
4 the concentrations, converted them back to curies per
5 year and essentially this was factored into the
6 spreadsheets. So when we look at the source term, the
7 first part is built on concentration ultimately
8 converted to curies per year. The second part is
9 curies per year as defined by the applicant in the ER
10 and SSAR and then the two are summed internally within
11 the spreadsheet to make that distinction.
12 JUDGE ELLEMAN: All right.
13 JUDGE KARLIN: Can I ask something about
14 those source terms that I think you're talking about?
15 Did they only cover the light water reactors, the two
16 to three from which there is a design certification?
17 Do they cover the gas cooled? Do they cover the
18 pebble bed reactor, those source terms you're using or
19 assuming in here?
20 MR. DEHMEL: They made a determination in
21 rev. 9. They actually have removed any and all
22 information as to where the information specifically
23 came from, from the --
24 JUDGE KARLIN: They, the Applicant.
25 MR. DEHMEL: The Applicant, yes. If you

1 look at prior submittal of the application, the ESP
2 application, they had where the tables were
3 constructed somewhat separately and they had
4 identified radionuclides and for some cases, they
5 would assign a letter. So there would be, for
6 example, the rate one curies (b) and look at footnote
7 (b) and it said, "This value is an assumed value and
8 it comes from the KCR 700" and similarly for the other
9 radionuclides. And as a result of looking at a source
10 term and looking at the issue of tritium or liquid
11 effluent in rev. 9, the Applicant simply revised the
12 table, footnoted the data and removed any and all
13 references specific plants or specific reactor design
14 simply noting in the footnotes that the source terms
15 are based on the following type of reactor designs
16 without going into the details.
17 JUDGE KARLIN: Okay.
18 MR. DEHMEL: And beyond that, I can't
19 explain that.
20 JUDGE ELLEMAN: One way I tried to look at
21 the PPE values is to mentally break them down into
22 three categories. One category is values you know the
23 answer to at the COL or OL stage, things like how tall
24 the buildings are and characteristics like that. The
25 second is values you only know the answer to after the

1 plant is operating. An example of this would be the
2 chi/q values for normal releases. You would find out
3 what those really are by in-field measurements and
4 actual source term measurements for the operating
5 plant. The third quantity is ones you may never know
6 the value to, the chi/q values for design basis
7 accidents and severe accidents. Hopefully, you never
8 have the chance to figure out what those are.
9 For the second category of terms, do you
10 as NRC go back when that plant is operating and cross
11 check what the claimed PPE values were against what
12 the actual operation turns out to be as a way of
13 verifying the adequacy of your PPE approach or
14 otherwise evaluating the whole process?
15 MR. DEHMEL: My understanding is that once
16 a COL application is submitted and an operating
17 license is granted, that application becomes the
18 governing document such that if the PPE value happens
19 to be the same in the COL application package, so be
20 it. But the odds are most likely it will be different
21 because I can't imagine an applicant using these kind
22 of worst possible source terms and translating that
23 directly into a COL application package because there
24 are some issues associated with this.
25 But let's assume that you have two cases.

1 One is they translate and adopt the PPE values and put
2 them in the COL application, but then it becomes the
3 basis of the license and the license condition. If
4 there were no changes to the chi/q, d/q, the dose
5 receptors were the same, all the conditions are
6 described in the ESP were the same, then you could
7 expect that the dose estimates are presented in the ER
8 and the SSAR will be the same because essentially
9 nothing has changed. The source term is the same.
10 The chi/q's that are presented in the ER and the SSAR
11 are the same. The dose receptors have not changed.
12 JUDGE ELLEMAN: Right.
13 MR. DEHMEL: But I think what would happen
14 more realistically is that with the application
15 package, the COL application package, a new source
16 term will be developed to reflect the actual type of
17 NSSS system that is used and the actual type of rad
18 waste processing technology for liquid waste and
19 gaseous waste. That would result in a different
20 source term and as a result of this, the offsite doses
21 on the assumption again that the chi/q's don't change,
22 that the dose receptors are the same, the doses will
23 go down because now you have a lower source term. All
24 other parameters are essentially equal. The
25 atmospheric dispersion and disposition parameters are

1 the same. The dose receptor have not changed. You
2 assumed the same kind of land use status. The same
3 hours are spent boating and swimming and so on. So
4 everything remains the same. The only thing that
5 changes is the source term. So the doses would have
6 to be lower.
7 That becomes in essence the basis on which
8 you would compare the operating experience against the
9 SER, against the EIS. Now it's conceivable that the
10 NRC sometime in the future would look at the first two
11 or three or five annual effluent release reports and
12 look at what the newly licensed facility is generating
13 with respect to effluence and doses and compare that
14 to the COL application and the EIS and determine
15 whether or not are there any significant differences.
16 There are provisions in the reg. that
17 would allow the staff to do that and perhaps even
18 impose additional requirements. But that essentially,
19 you have to wait until you have a number of
20 inspections completed and once you start to review a
21 number of annual effluent release reports as well as
22 results of the radiological environmental monitoring
23 program results and weigh all this information
24 together.
25 JUDGE ELLEMAN: Okay. I think the answer

1 I've inferred from your comments is that, yes, the NRC
2 may do some of these things, but the PPE values are
3 essentially off the table at this point. They have no
4 further relevance in the regulation of the plant in
5 any way.
6 MR. DEHMEL: Right, because the COL
7 becomes the basis of the license and the license may
8 have some specific license conditions. So what's
9 governing the operation of the plant is the license
10 and the approval of the issuance of the license is
11 based on the COL application.
12 JUDGE ELLEMAN: Okay. One of the
13 questions that we ask -- Let me see if I can find my
14 right notes here. Yes. This is not normal releases.
15 This is really related to design basis accidents. We
16 ask you for a comparison of the calculated chi/q
17 values for two different confidence levels. You had
18 supplied values that were at 50 percent confidence
19 level and we asked for values at a 95 percent
20 confidence level which you gave to us. And I was
21 interested in noting that there's a significant
22 difference between those numbers. There is almost a
23 factor of 10 difference between a 50 percent
24 confidence level value and a 95 percent confidence
25 level value.

1 MR. DEHMEL: I am sorry. I cannot answer
2 that question. I am not a meteorologist.
3 MS. POOLE: Your Honor.
4 JUDGE ELLEMAN: This has nothing with
5 meteorology. It has to do with data and how one looks
6 at data.
7 (Off the record comments.)
8 MS. POOLE: I apologize, Judge Elleman.
9 We have James Van Ramsdell with us. He's identified
10 on our witness list and he is qualified to answer that
11 question as he worked on the accident.
12 JUDGE ELLEMAN: Okay. It really isn't an
13 accident question. It's a question related to how you
14 deal with very uncertain data with numbers that have
15 very high standard deviations associated with them and
16 will he be on a future panel? I'm happy to defer the
17 --
18 MS. POOLE: He will be -- He's not
19 identified to sit on a panel at the moment, but we
20 have him present. I'm sorry. No, he was identified -
21 - Pardon me. He was identified on our witness list,
22 but he is not currently scheduled to be on a panel.
23 JUDGE ELLEMAN: Okay. Let me continue
24 where I'm heading for on this question and if there's
25 somebody else you feel is more appropriate to speak to

1 it, I'm happy to have that happen.

2 MR. DEHMEL: Your Honor, can you refresh

3 my memory as to which question you are referring to

4 now?

5 JUDGE ELLEMAN: Okay. I'm referring to

6 the fact that calculated chi/q values that are

7 represented at a 50 percent competence level --

8 JUDGE KARLIN: What question was that?

9 MR. DEHMEL: What question? Where is the

10 question at?

11 JUDGE ELLEMAN: The question were E-78 and

12 E-80. The E is environmental questions. So it's

13 questions 78 and 80 on our environmental list and you

14 included in your answer.

15 MR. DEHMEL: Yes, the man who will answer

16 the question is here.

17 JUDGE ELLEMAN: The man that actually did

18 the work.

19 MR. DEHMEL: Yes.

20 JUDGE ELLEMAN: Okay. I'm happy to let

21 him speak to it, but where I'm heading is not with

22 respect to those specific numbers. I'm heading with

23 how you deal with very uncertain calculations where

24 there is a large standard deviation in the number.

25 You're nodding your head. So --

1 JUDGE KARLIN: All right. Why don't we
2 have this gentleman come in and if you could, sir --
3 WHEREUPON,
4 JAMES V. RAMSDELL
5 was called as a witness, and having been first duly
6 sworn, was examined and testified as follows:
7 JUDGE KARLIN: Okay. Please sit down.
8 Would you identify yourself for the record, sir?
9 MR. RAMSDELL: My name is James V.
10 Ramsdell. I'm a meteorologist, Pacific Northwest
11 National Laboratory. I also do absent calculations
12 for this SER.
13 JUDGE KARLIN: And, Mr. Ramsdell, the
14 staff file written testimony under your signature.
15 MS. POOLE: Yes, we have an affidavit and
16 statement of professional qualifications for him in
17 the record.
18 JUDGE KARLIN: Right. Okay. Great.
19 Thank you.
20 JUDGE ELLEMAN: Yes. I'm simply setting
21 the stage here for the questions I wanted to ask. The
22 values that appear for different confidence levels can
23 be substantially different, a factor of nine when I
24 looked at them. And what that says to me is that
25 there is a large variance in the calculation of these

numbers that if I were to make a plot of a value along the abscissa of a plot versus the probably of getting that plot, I would get some kind of a normal distribution that is widely spread. It is a very spread distribution in numbers. Okay so far?

MR. RAMSDELL: Yes. The procedure for calculating chi/q for both the accident case or the SER and then the EIS is laid out in Regulatory Guide 1.145. It involves calculating chi/q at the exclusion area boundary for every hour a year. So you have 8,000 values, 8,760 values, in a standard year of chi/q. These values are then ordered in a program -- The program used to calculate these is called PAVAN, P-A-V-A-N. What you end up is a cumulative frequency distribution of chi/q values.

JUDGE ELLEMAN: Yes.

MR. RAMSDELL: You draw the 50 percent value for use in the FEIS and then 95th percentile value for the SER.

JUDGE ELLEMAN: Yes.

MR. RAMSDELL: From this distribution of 8,000. The Applicant has submitted several years of meteorological data and I've looked at many years of meteorological data at other sites and the year-to-year variability in the 95th percentile value is of

1 the order of 4 or 5 percent or 10 percent. It's not
2 large. The number of hours in a year and the
3 meteorological conditions over a year are reasonably
4 consistent from year-to-year at a given site so that
5 even though there's a large difference between the
6 medium value and the 95th percentile value, the
7 uncertainty in the 95th percentile value is not
8 particularly large.
9 JUDGE ELLEMAN: The uncertainty year-to-
10 year is not large.
11 MR. RAMSDELL: The year-to-year
12 variability in 95th percentile value is not very
13 large.
14 JUDGE ELLEMAN: Okay. But doesn't that
15 large spread tell me that the reliability of your
16 number is not particularly good, that there is a good
17 large variance associated with the calculation.
18 MR. RAMSDELL: There is a large
19 variability in the chi/q from time to time during the
20 day, season to season, for accident calculations.
21 JUDGE ELLEMAN: Yes.
22 MR. RAMSDELL: You can go in the middle of
23 the day in the summer to middle of the night in the
24 winter and that's an extremely large range of
25 meteorological conditions and dispersion conditions

1 and depending on wind direction, wind speed, at the
2 time of the accident, it can be an extremely large
3 variation in dose.
4 JUDGE ELLEMAN: Okay. So when you quote
5 a 50 percent value, half the time you could get a
6 value that differs by as much as a factor of 10.
7 MR. RAMSDELL: Yes. Half of the time you
8 could get a value that's ten times more.
9 JUDGE ELLEMAN: That's right. And half
10 the time you get one that's --
11 MR. RAMSDELL: As high as. And half the
12 time you could get -- A small percentage of the time
13 you could get a value that's a factor of 10 higher,
14 not half the time, but half of the time it should be
15 larger. Half of the time it should be smaller.
16 JUDGE ELLEMAN: Yes.
17 MR. RAMSDELL: Perhaps five percent it may
18 be as much as a factor of 10 higher.
19 JUDGE ELLEMAN: Right.
20 MR. RAMSDELL: Or similarly, you have the
21 same sort of a chance of being a factor of 10 lower.
22 JUDGE ELLEMAN: Of course. You have --
23 MR. RAMSDELL: That's the essential
24 difference between the design basis accidence
25 calculations for the safety analysis and for the

1 environmental analysis.

2 JUDGE KARLIN: This is the 95th percentile

3 versus 50th percentile, this level?

4 MR. RAMSDELL: Yes. Correct.

5 JUDGE KARLIN: And which is which now?

6 MR. RAMSDELL: The safety you take a chi/q

7 value which is exceeded no more than five percent of

8 the time.

9 JUDGE KARLIN: All right.

10 MR. RAMSDELL: You take the conservative

11 value. For the environmental statement, you take the

12 50 percentile value, a typical value.

13 JUDGE KARLIN: Okay. Thank you.

14 JUDGE ELLEMAN: I think what I found

15 troubling in reading the documents is you will see in

16 print a number sometimes to three significant figures

17 that are 50 percent chi/q probability and what the

18 reader doesn't recognize is that five percent of the

19 time you can get at least a factor of 10 higher value

20 for that chi/q than what is quoted in the plan.

21 Agreed?

22 MR. RAMSDELL: Perhaps.

23 JUDGE ELLEMAN: Yes.

24 MR. RAMSDELL: Perhaps relative to your

25 order of magnitude. For some sites, it may not be an

1 order of magnitude. It may be a factor of five
2 instead, but it's significantly higher.
3 JUDGE ELLEMAN: Significantly higher.
4 Okay. Now the way the scientific community approaches
5 problems like this is you put a variance on your
6 number. You put a standard deviation on it that
7 reflects the degree of confidence that you have in
8 that number.
9 MR. RAMSDELL: In this case, the degree of
10 confidence would be my degree of confidence in the
11 50th percentile value which would be fairly small. It
12 would not be -- I'm not looking for a variance on the
13 distribution. I'm looking for a confidence in the
14 specific value.
15 JUDGE ELLEMAN: A day-to-day confidence
16 for.
17 MR. RAMSDELL: Well, on the value that I'm
18 using in the FEIS, I'm looking at the confidence in
19 that value which is a 50th percentile value. I'm not
20 trying to describe the full distribution of chi/q's.
21 I am trying to describe only the median value.
22 JUDGE ELLEMAN: But isn't the full
23 distribution important in understanding what's really
24 going to happen?
25 MR. RAMSDELL: Not in the environmental

1 space.

2 JUDGE ELLEMAN: Okay. I think this is

3 where I get lost. If I see a spread in numbers which

4 can spread over two orders of magnitude around a

5 median, that tends to suggest to me that values

6 substantially different from the one presented in the

7 report could be obtained in real life.

8 MR. RAMSDELL: That's correct.

9 JUDGE ELLEMAN: Okay. And why is this not

10 represented in some way in the written material that

11 people are reading and attempting to interpret?

12 MR. RAMSDELL: It's in the material. If

13 you look at the safety report, you will see the

14 conservative number the high number. If you look at

15 the environmental, you'd see a reasonable estimate of

16 the typical value. The two reports serve entirely

17 different purposes. One is a safety assessment under

18 the Atomic Energy Act. The other is a NEPA analysis.

19 JUDGE ELLEMAN: Yes.

20 MR. RAMSDELL: And the NEPA analysis is

21 geared toward reasonable, realistic sorts of numbers,

22 not a safety analysis.

23 JUDGE ELLEMAN: But isn't knowing the

24 reliability of the number you are calculating

25 important in both instances? Isn't that something you

1 intrinsically want to know?

2 MR. RAMSDELL: The reliability of the

3 number would be the year-to-year variability of the

4 50th percentile value, not the characterization of the

5 full distribution.

6 JUDGE ELLEMAN: Okay. I guess I'm having

7 a little trouble processing that, but what you're

8 saying is certainly consistent with what we have in

9 the responses to our questions.

10 JUDGE KARLIN: Can I just ask? If one

11 reads the SER and the EIS which I did and those are

12 long documents, we all did, would I find -- I don't

13 remember finding a statement that the SER is at a 95

14 percentile confidence level and the EIS is a 50

15 percent confidence level. Would I find that

16 explicitly stated?

17 MR. RAMSDELL: In the section on design

18 basis accidents in the FEIS, there is a discussion in

19 the difference between the Applicant's chi/q values

20 and the staff's chi/q values and the method that they

21 were calculated. The staff calculated median or 50

22 percentile values and used those. The Applicant used

23 I believe the 95th percentile value saying they're

24 conservative and we meet regulations.

25 JUDGE KARLIN: Okay. So it is said

1 somewhere in the FEIS.

2 MR. RAMSDELL: Yes.

3 JUDGE KARLIN: Okay. I didn't catch it.

4 Thank you.

5 JUDGE ELLEMAN: Maybe I belabored this as

6 far as I can go. The concern I guess I'm expressing

7 is that a reader when they see a number and this is,

8 say, a chi/q value which is at a 50 percent level and

9 is defined as a realistic number, I don't know that

10 they appreciate that it's possible to get a value that

11 is substantially different from that number that's

12 being presented in print and I think the reader would

13 better understand this if there some way to explain

14 what's really happening here in the development of

15 these numbers. You're nodding your head.

16 MR. RAMSDELL: I am agreeing with your

17 statement that if a reader wanted the distribution,

18 there would be a method of putting it in. Whether it

19 is appropriate on the EIS or not, I'm --

20 JUDGE ELLEMAN: You don't have an opinion

21 as to whether it is.

22 MR. RAMSDELL: I think that the EIS if

23 written for a knowledgeable reader, not someone who

24 understands the area or at least has a reasonable

25 background. We've talked about the approximate order

1 of magnitude differences between the median value and
2 the 96th percentile value.
3 JUDGE ELLEMAN: Yes.
4 MR. RAMSDELL: That's only for short
5 periods of time. As you go out toward -- That's for
6 one or two hours.
7 JUDGE ELLEMAN: Yes.
8 MR. RAMSDELL: If you go to eight hours or
9 24 hours, this difference decreases significantly and
10 when you get toward 30 days, it's a factor of two to
11 three.
12 JUDGE ELLEMAN: And that's certainly true,
13 I'm sure. But for many events, the one-to-two hour
14 period is the important one.
15 MR. RAMSDELL: That's right.
16 JUDGE ELLEMAN: And that's the one you're
17 dealing with.
18 MR. RAMSDELL: That's the one we calculate
19 for design basis accidents. We calculate the
20 exclusion area boundary.
21 JUDGE ELLEMAN: And there it does make a
22 difference.
23 MR. RAMSDELL: Yes.
24 JUDGE ELLEMAN: Well, I -- I didn't get
25 anywhere in my questioning and I appreciate your

1 presenting further information on this subject for us.
2 I thank you for your comments.
3 MS. POOLE: Your Honors, with the Board's
4 indulgence, I know this is not the normal order of
5 things. May I ask Mr. Ramsdell two clarifying
6 questions that might assist?
7 JUDGE KARLIN: Sure.
8 JUDGE ELLEMAN: That's fine with us.
9 JUDGE COLE: Go ahead.
10 MS. POOLE: Mr. Ramsdell, by way of
11 example, what is the variance or uncertainty in the
12 measurement of first wind speed and second, wind
13 direction?
14 (Laughter.)
15 MR. RAMSDELL: What instruments? What
16 averaging period? There are a number of things. For
17 a typical meteorological installation at a nuclear
18 facility, I would expect wind direction to be plus or
19 minus 3 to 5 degrees variance and wind speed plus or
20 minus a mile an hour. If you look at Regulatory Guide
21 1.23, it will probably have smaller limits than that.
22 But as a practical matter, I would be happy with plus
23 or minus 5 degrees and a mile an hour.
24 MS. POOLE: Okay. And secondly, you are
25 speaking exclusively regarding accident analyses. Is

1 that correct?

2 MR. RAMSDELL: That is correct. Yes.

3 JUDGE ELLEMAN: Which I recognize also.

4 I was trying to belabor a principle here, not accident

5 releases per se.

6 MR. RAMSDELL: Right.

7 JUDGE ELLEMAN: I think I have no further

8 questions.

9 JUDGE COLE: Yes, just one or two

10 questions. Mr. Ramsdell, is it?

11 MR. RAMSDELL: Yes.

12 JUDGE COLE: You indicated that the staff

13 uses the 50th percentile. You were talking then about

14 in the EIS, right?

15 MR. RAMSDELL: That is correct.

16 JUDGE COLE: Because in the SER, what

17 percentage do they use?

18 MR. RAMSDELL: It's 95th percentile.

19 JUDGE COLE: Thank you.

20 JUDGE KARLIN: I just had -- Are you done?

21 JUDGE COLE: Just one.

22 JUDGE KARLIN: I'm sorry.

23 JUDGE COLE: A short question. With

24 respect to Safety Question 87, it's really related to

25 85 where we talked about the difference between the

1 estimates for a dose of 6.4 millirem per year
2 associated with the new plants and 0.32 millirem per
3 year associated with the existing plants and the large
4 difference in those numbers.
5 Now in Question 87, you talk about how you
6 take the Applicant's data, the 0.64 millirem and you
7 apply the principles of ALARA to that. What do you do
8 with that because obviously there's very large
9 difference there between these two, a factor of 20?
10 Did that give you pause? Did you go back to the
11 Applicant and say "Is this number really right" or
12 "Are you being overly cautious or much too
13 conservative?? Why is the number so big?
14 MR. DEHMEL: Now let me make a
15 clarification there. The way the information is
16 presented in response to Question 87, it only refers
17 to the ALARA dose objective of any site to the
18 Appendix I 10 CFR Part 50. It doesn't mean that we
19 did ALARA analysis. It means simply referring
20 properly to the regulatory requirements. So we did
21 not do an ALARA analysis because as I stated earlier,
22 the application did not have any kind of information
23 of the kind of liquid and rad waste processing system
24 with which the staff would confirm whether or not
25 these releases are ALARA. So we did not do that.

1 This is just a question of nomenclature use in
2 responding to your question.
3 JUDGE COLE: It says here "Using the
4 information contained in the application and input
5 data, the staff performed an independent evaluation of
6 doses to the maximally-exposed individual against the
7 ALARA dose objectives of Appendix I."
8 MR. DEHMEL: The ALARA dose objective is
9 3 millirem per year for liquid effluence and the
10 corresponding limits for gaseous effluence. I'm sorry
11 it misled you in the response to the question. Maybe
12 the proper response would have been "to the maximally-
13 exposed individual against the dose objective of
14 Appendix I to 10 CFR Part 50." That might have been
15 a proper response and not essentially trick you into
16 the other portion of Appendix I. I understand.
17 JUDGE COLE: So I guess the time to look
18 at that is after the plant is in operation and you get
19 some information and find out that they can actually
20 get it a lot lower than that.
21 MR. DEHMEL: No, it's at the COL stage.
22 At the COL stage, the Applicant is supposed to define
23 the kind of reactor technology that is going to be
24 used and outline the rad waste processing system for
25 liquid effluence and gaseous effluence. At that

1 point, that kind of a technology would be described
2 with enough detail such that we can redo the analysis
3 so to speak, taking into account the information
4 that's provided and confirm whether or not dose
5 objectives have been met and then do the second step
6 of the analysis which is the ALARA according to
7 Section (2)(d) of Appendix I.
8 JUDGE COLE: All right, sir. Thank you.
9 MR. RAMSDELL: Your Honor, may I make an
10 additional comment?
11 JUDGE KARLIN: Sure. Go ahead.
12 MR. RAMSDELL: Related to showing of the
13 chi/q values, I believe if you look in chapter 2.7 of
14 the SER you will see the chi/q values by direction of
15 wind speed and atmospheric stability which will show
16 the full range of chi/q values.
17 JUDGE ELLEMAN: I believe that. Yes.
18 Thank you.
19 JUDGE KARLIN: Before we close, I think
20 we've asked all the questions we need to. I might
21 give you an impression I had, a surprised impression,
22 from reading the staff's safety evaluation report.
23 Mr. Dehmel is the most pithy and shortest wordy person
24 on the planet or I'm missing something. This is 400
25 page or so document and it deals with the siting of

1 two nuclear plants and I look at the number of pages
2 that are devoted to routine releases from
3 radiological, there are over 120 pages devoted to
4 seismic. There is over 50 pages devoted to
5 hydrologic. There are 30 pages to meteorology.
6 You would think nuclear radiologic
7 releases from a nuclear power plant would be
8 important. The actual section is three pages out of
9 these 400 pages. When we deal with liquid effluence,
10 there is one section, one half of one page, liquid
11 effluence. It's very pithy. We've just spend a good
12 better part of a day and a half dealing with some of
13 the liquid effluence and you put it all into one page.
14 I really would have liked to see a little
15 more as sort of a nontechnical person approaching
16 this. A lot of cross reference to the SAR was there
17 which you had to dig through to find out what was
18 really going on and I just thought it was -- I was
19 stunned that there was a such a short section on
20 radiological effluent release, dose consequences for
21 normal operation. This may be the norm, but this is
22 the first time I've had to look at that particular
23 section in a mandatory hearing.
24 MR. DEHMEL: In my defense, Your Honor --
25 JUDGE KARLIN: No, you did good. You were

1 very short.

2 MR. DEHMEL: I have six pages in the

3 supplement EIS.

4 (Laughter.)

5 MR. DEHMEL: Secondly, you're correct.

6 There's a template for these things and again --

7 JUDGE KARLIN: I know.

8 MR. DEHMEL: I cannot on my own add

9 material that essentially is not recognized by the

10 Agency.

11 JUDGE KARLIN: Well, I think that that

12 approach really obscures or it fails to provide

13 information to the public. If anyone really wanted to

14 try and plow through this and read, they wouldn't have

15 a satisfactory opportunity to have any chance of

16 understanding even if they're reasonably intelligent

17 and trying really hard. But with that said, that was

18 my reaction. I was very surprised by how short it

19 was.

20 We don't have any more questions. Does

21 the staff have any further clarification questions?

22 MS. POOLE: Yes, Your Honors. I have a

23 couple clarifying questions for Mr. Dehmel if I may.

24 JUDGE KARLIN: Yes.

25 MS. POOLE: Mr. Dehmel, looking at Slide

1 19 which is actually up on the screen at the moment,
2 earlier in your presentation you had a discussion with
3 Judge Karlin on the staff's finding on the adequacy of
4 radiological monitoring program for the new units. In
5 your opinion in view of the new information provided
6 by Dominion, is that a matter for the operating units?
7 MR. DEHMEL: That is correct. It's a
8 license condition issue for the operating units.
9 MS. POOLE: Okay. In your opinion, does
10 that new information that was provided since the
11 completion of your assessment of the ESP application
12 regarding tritium create an adequate protection issue,
13 in your opinion?
14 MR. DEHMEL: None in the -- There are no
15 issues in the context of the SER. It does not change
16 the conclusion of the SER. I stands in its current
17 version of Supplement 1.
18 MS. POOLE: And finally, if in your
19 opinion, you were to find an inadequate protection
20 issue in view of information such as this, would you
21 reexamine the issue and revisit your safety
22 conclusion?
23 MR. DEHMEL: Absolutely.
24 MS. POOLE: That's all we have.
25 JUDGE KARLIN: Okay. With that, I think

1 we're due for a break here. It is 3:34 p.m. by the
2 clock back there. Why don't we reconvene at 3:45 p.m.
3 and we'll start with the Applicant's panel on this
4 topic? Off the record.
5 (Whereupon, at 3:34 p.m., the above-
6 entitled matter recessed and reconvened at 3:46 p.m.
7 the same day.)
8 JUDGE KARLIN: All right. We're back on
9 the record, Mr. Court Reporter.
10 And both of you gentlemen have been sworn
11 in earlier during the proceedings, so I'll just remind
12 you you're still under oath, if you would remember
13 that, please.
14 Welcome. Please proceed with your
15 presentation.
16 MR. TARANTINO: Thank you, Your Honors.
17 This afternoon I will be discussing the confidence in
18 the estimated doses, liquid and gaseous effluents from
19 our existing Units 1 and 2. Mr. Ken Jha over here is
20 available to respond to any questions concerning the
21 confidence in any of the calculations that were
22 performed in support of the new units.
23 So with that, we'll begin with Slide
24 Number 2. Slide 3. Okay. We'll quickly go over --
25 JUDGE KARLIN: Number 3? Slide 3?

1 MR. TARANTINO: It's Slide Number 3, Your
2 Honor.
3 JUDGE KARLIN: Okay.
4 MR. TARANTINO: I was looking at a page
5 number instead.
6 JUDGE KARLIN: Okay.
7 MR. TARANTINO: Slide Number 3, quickly go
8 through this. The staff has presented the regulatory
9 documents on which the radioactive effluent monitoring
10 program is based on. In addition to those regulations
11 that are listed on here, it also included any
12 applicable -- the reg guides and NUREGs that Dominion
13 uses in its performance of effluent dose calculations
14 and forming its basis.
15 Furthermore, to point out that the Units
16 1 and 2 have their respective license technical
17 specifications, and we had radiological effluent
18 technical specifications that were based on NUREG-0472
19 for North Anna Units 1 and 2.
20 Those technical specifications were
21 transferred into the station's offsite dose
22 calculation manual, which is an administrative
23 procedure, VPAP it's called, 2103N for North Anna.
24 And per Generic Letter 8901, that transfer -- that
25 allowed us to transfer them out of a technical

1 specification document into a station document.

2 Next slide.

3 Okay. Our focus here is on our

4 radioactive effluent monitoring program. And

5 essentially there is two main components of the

6 radioactive effluent monitoring program. Clearly, it

7 is designed to meet the regulations. And two measures

8 are also -- these two measures are also considered

9 both preventive and mitigative while meeting our

10 regulations.

11 They are governed by a program that has

12 been approved and endorsed by the NRC, and through now

13 our offsite dose calculation manual, which is an

14 approved document by the NRC.

15 The first component of the effluent --

16 radioactive effluent monitoring program that I wish to

17 present is the in-plant sampling and analysis program.

18 Dominion has a host of procedures, administrative and

19 technical working-level procedures and periodic test

20 procedures which all of the surveillances and

21 frequencies for performing collection of samples,

22 making sure that they are analyzed in a timely manner,

23 and the frequency for those, those are all controlled

24 by internal procedures.

25 When these samples are taken and

1 collected, then there is a management of the releases
2 through what is called the radioactive release
3 permitting program for liquids and for gases. So one
4 part of this effluent monitoring program is early on
5 taking the samples at a known -- at a particular
6 frequency -- it could be weekly, monthly, quarterly,
7 it could be a grab sample, it could be a composite
8 sample, and then going through a series of steps to
9 determine if those samples from a given -- let's say
10 a waste gas tank is one example -- could be released
11 and should be released at a certain time.
12 So it involves radiation protection,
13 chemistry, operations, input, before -- and we get to
14 the point where it's authorized.
15 The second component of the program is our
16 radiation monitor setpoint program, and that is for
17 all of the monitored effluents from Units 1 and 2 --
18 program by which the liquid and gaseous effluent
19 monitors' setpoints are established.
20 And these setpoints are established such
21 that the Part 20 concentration and dose rate limits
22 would not be exceeded. And they are typically and
23 conservatively established and set such that the alarm
24 settings are well below the actual federal limit.
25 It's at an administrative setting below that to give

1 an adequate buffer.

2 Next slide.

3 On the radiation monitor setpoint program,

4 and on Slide Number 5 it's pointed out the gaseous

5 effluent monitors -- can we go back to Slide 4? Just

6 to point out the liquid effluent monitors.

7 The pathways that are monitored are listed

8 there for the liquid pathways. We have a rad waste

9 effluent line, we have a surface water system effluent

10 line, a condenser circulating water line, and a steam

11 generator high capacity blowdown line. And these

12 effluent monitors that monitor the liquid are all

13 prior to going through to the discharge tunnel, which

14 we've said earlier is the final point of discharge.

15 JUDGE KARLIN: And so on that Slide 4, the

16 liquid rad waste effluent line monitors, is that what

17 we were talking about earlier when we were looking at

18 how many picocuries per liter was involved in the rad

19 waste at any particular point liquid?

20 MR. TARANTINO: I don't believe that we

21 were necessarily talking about that particular

22 monitor, but we're using that in the context of any

23 type of sample that may be collected from them. It

24 could have been from one -- any one of these.

25 JUDGE KARLIN: Okay.

1 MR. TARANTINO: And then, on the next --
2 Slide Number 5 is now showing the monitored gaseous
3 effluent pathways, which for North Anna we have a
4 ventilation vent, actually two stack monitors, a
5 process vent, gaseous effluent monitor, and condenser
6 air ejectors for Units 1 and 2. So those govern the
7 gaseous monitored pathways.
8 JUDGE KARLIN: Let me ask on this -- this
9 is a dumb question I guess, but when I think of --
10 from an environmental perspective of a coal-fired
11 powerplant, they have a stack, they're burning coal,
12 out the stack comes particulate matter and maybe SOx
13 and NOx and other chemicals may come out of the stack,
14 and there's a monitor right there. And that's the
15 stack or the vent that's monitored.
16 I can't think of any analog in a nuclear
17 plant. So when you say the ventilation vent, what is
18 -- what are the inputs to that? Is it just the
19 ambient air inside of the reactor building, or what?
20 MR. TARANTINO: The ventilation from
21 auxiliary building, from safeguards building, from
22 containment, things such as we have -- we purge
23 containment. We may have releases from the waste gas
24 decay tank. All of these -- our condenser air ejector
25 goes through the ventilation vent.

1 The actual effluent monitor for that
2 pathway was the one I'm referring to for that line, so
3 you may have five or six different sources that are
4 all going through -- say through the ventilation vent
5 stack. And they are filtered, so we have iodine and
6 charcoal particulates, so we can get a -- when we talk
7 about doing an iodine particulate as well as gamma, we
8 have the media, if you will, medium from that stack to
9 do that at that location.
10 JUDGE KARLIN: Okay. I think that
11 answered my question. It's coming from just the
12 general inside of the buildings.
13 MR. TARANTINO: It's all from the -- yes,
14 the different sources from within and from multiple --
15 JUDGE KARLIN: Multiple rooms and --
16 MR. TARANTINO: Through the ventilation,
17 the design of the buildings.
18 JUDGE ELLEMAN: Now, you have not
19 mentioned the TLDs I know you must have out there to
20 measure accumulated doses in the field. That is also
21 a part of the general program?
22 MR. TARANTINO: Yes, Your Honor. We have
23 a network of TLDs, both onsite and offsite, ones that
24 are part of the environmental monitoring program. We
25 also have it for our area TLDs for monitoring, and is

1 the basis for our occupancies, the studies that we
2 have done for what is -- for monitoring individuals at
3 North Anna in and around and onsite.
4 Next slide.
5 The liquid and gaseous effluent dose
6 calculations that are performed use the Reg Guide
7 1.109 methodology, and several times the last couple
8 of days the term -- terminology "maximum exposed
9 individual" has been used, MEI.
10 That concept is from Reg Guide 1.109, and
11 I wanted to use this as an opportunity to point out
12 that per that reg guide "maximum" is defined with
13 regard to the parameters, such as food consumption,
14 the occupancy times, breathing rates, land usage.
15 Those are just a few examples.
16 So the reg guide is allowing a licensee to
17 use those types of parameters and those as inputs in
18 lieu of, let's say, an actual or realistic. I'd like
19 to point out that Reg Guide 1.109 is based on ICRP 2
20 and 10 methodology, and dose factors that are --
21 that's the source document for those dose factors,
22 dose conversion factors.
23 Furthermore, the reg guide goes on to say
24 that these parameters that we're saying are maximum
25 represent what they say are reasonable deviations from

1 an average for population in general. Basically,
2 instead of using what would be an actual breathing in
3 rate, let's say, for a child or a teenager, that
4 they're letting you -- they're giving you a number
5 that is considered conservative for that age group.
6 For North Anna, the liquid pathway per the
7 ODCM evaluation of all the different various pathways
8 for liquid and gaseous, here I have shown what has
9 been -- what has been defined as the limiting
10 pathways. In the case of liquids, then, we talk about
11 the drinking water, recognizing that Lake Anna is not
12 actually used for drinking water but conservatively
13 assuming that a maximum exposed individual were to be
14 at the end of a discharge canal and drinking water
15 8,760 hours a year.
16 The fish ingestion is the critical
17 pathway. So in terms of calculating the dose to a
18 critical organ, for North Anna it has been the
19 ingestion of fish. And the critical organ has -- for
20 the most part has been the liver and has sometimes
21 switched to the GILLI, so -- but those were the
22 critical organs and continue to be at -- for the
23 liquid pathway.
24 For the gaseous pathway, the limiting
25 pathways have been ground deposition and inhalation,

1 and the ingestion of vegetation has been the limiting
2 pathway. So that is -- in our ODCM and every time a
3 dose calculation is done, all of the pathways are
4 relooked at. And if it changes, we'll know that when
5 we do the calculation.
6 Next slide.
7 Slide Number 7 is giving the effluent
8 doses, liquid and gaseous, from Units 1 and 2 for the
9 year 2005 -- the most recent annual data that we are
10 providing. And you can see here that the effluent
11 doses for liquid and gaseous, the fractions of the
12 Part 50 Appendix I limits for a two-unit site are well
13 -- are fractions of that limit.
14 I'd also like to point out that of the
15 liquid total body and critical organ doses that are
16 seen, we've been talking about treating quite a bit,
17 which is why I would like to just mention this, is
18 that the tritium contribution to the liquid total body
19 and critical organ doses in 2005 is the majority of
20 its dose. It was actually 97-1/2 and 92 percent of
21 the total dose was due to tritium for that particular
22 year.
23 For the gaseous doses, the total body and
24 critical organ doses, tritium contributed a much
25 lesser percentage -- 37 percent and 34 percent,

1 respectively, again for 2005.

2 I believe that concludes the formal

3 presentation, and we're open for -- if you have

4 questions for us.

5 JUDGE KARLIN: Okay. Thank you. Dr.

6 Elleman?

7 JUDGE ELLEMAN: Just a few questions,

8 please. I had the impression from your earlier

9 comments that your main technique for analogs and for

10 released isotopes is gamma ray spectrometry with a few

11 chemical separations like for strontium-90 to look for

12 the concentration of those isotopes. Is that correct?

13 MR. TARANTINO: The gamma isotopic is one

14 of the most routine sample analysis that we do.

15 Tritium, liquids -- liquid simulation counting is

16 another very common analysis that we do at the station

17 in our own laboratory. Alpha-beta proportional

18 counting is another.

19 And then, we do send to the offsite vendor

20 for strontium analyses. We also do the iodine and

21 particulates analysis in-house, our charcoals.

22 JUDGE ELLEMAN: For those isotopes that

23 could be important isotopes, do you ever -- and they

24 are below your detection limits with the other methods

25 you use. Do you ever do any chemical analyses for

1 those just to confirm what their levels are?

2 MR. TARANTINO: We have -- we participate

3 in an interlaboratory comparison program and also a

4 quality control program where we -- the vendor that we

5 use for select analyses are sent off, and we will do

6 a cross-check for those more sophisticated analyses

7 that we don't routinely do at our own laboratory.

8 And for things such as hard-to-detect

9 nuclides, we don't have the capability in-house. We

10 would also send them off on a per case basis.

11 JUDGE ELLEMAN: And I gather the

12 background in your TLDs is so high that you can never

13 see anything related to an actual plant exposure on

14 TLDS, or is that offsite TLDs?

15 MR. TARANTINO: Are you talking about like

16 our environmental TLDs?

17 JUDGE ELLEMAN: Yes.

18 MR. TARANTINO: I mean, typically, our

19 environmental TLDs are way down in the noise range

20 or --

21 JUDGE ELLEMAN: In the background.

22 MR. TARANTINO: -- background range.

23 JUDGE ELLEMAN: Why do you have gamma dose

24 as millirads rather than millirems on that slide?

25 MR. TARANTINO: The Part 50 Appendix I,

1 the units for the gamma and beta are in rad. That's
2 the unit that --
3 JUDGE ELLEMAN: Millirem versus millirads.
4 MR. TARANTINO: But the air dose, that's
5 an air dose.
6 JUDGE ELLEMAN: Air dose, okay.
7 MR. TARANTINO: Exposure.
8 JUDGE ELLEMAN: Oh, okay. Yes, okay.
9 JUDGE KARLIN: And on that chart you're
10 showing a 20 millirad for gas. Is that because you
11 have -- you're talking about two reactors?
12 MR. TARANTINO: That is correct, Your
13 Honor. It's --
14 JUDGE KARLIN: Doubling the --
15 MR. TARANTINO: Doubling.
16 JUDGE KARLIN: It is a per reactor
17 regulatory provision, and it deals with lightwater
18 reactor, does it not?
19 MR. TARANTINO: That is correct, Your
20 Honor.
21 JUDGE KARLIN: So it wouldn't deal with 16
22 double-bed modular reactors, right?
23 MR. TARANTINO: The part -- these design
24 objectives would be typically applied, I mean, to
25 those type of -- how many units. That would be

1 ratioed for those number of units, and they would --

2 JUDGE KARLIN: Well, we don't know what it

3 would be. All we know is this reg would not address

4 what would happen in a double-bed modular reactor

5 situation, because this reg deals with lightwater

6 reactors, and double-bed modular reactors are not

7 lightwater reactors. So we're left to our devices, as

8 it were, to figure out what the standard should be for

9 them.

10 MR. TARANTINO: That is correct.

11 JUDGE KARLIN: Yes.

12 JUDGE ELLEMAN: Do you think it is

13 possible that you could have a mix of fission product

14 activities present in the environment that are below

15 your detection limits individually, but in combination

16 would give an accumulated total body dose or dose to

17 a critical organ that might be significant?

18 MR. TARANTINO: Professionally speaking,

19 I would not think that that would be -- we would --

20 JUDGE ELLEMAN: Do you think your

21 detection --

22 MR. TARANTINO: I think our detection --

23 JUDGE ELLEMAN: -- sensitivities are

24 sufficiently low you can preclude that --

25 MR. TARANTINO: I believe so.

1 JUDGE ELLEMAN: -- as a possibility? Yes,
2 okay.
3 I do have one question related to the 2005
4 annual radiological report which you made, and it was
5 given to us. And I don't know that we need to look at
6 it. You can perhaps answer my question without
7 looking at it. Page 60 of that report, you have a
8 plot of TLD measured doses, which are summarized over
9 a multi-year period. And they're quite constant, and
10 it's a level line and it suddenly drops, and then it
11 goes along again for a level line.
12 But there's a dislocation in the dose on
13 that plot. Do you have any idea what's going on or
14 what caused that?
15 MR. TARANTINO: No, I do not, Your Honor.
16 I would either have to defer to -- well, look at the
17 report first, and then possibly have to defer to --
18 JUDGE KARLIN: We can have them get the
19 report.
20 JUDGE ELLEMAN: Yes, I can maybe -- have
21 you got one there?
22 MR. TARANTINO: Yes.
23 JUDGE ELLEMAN: Look on page 60 of that
24 report.
25 JUDGE KARLIN: And which report is this?

1 JUDGE ELLEMAN: It's the 2005 annual
2 radiological report.
3 MR. TARANTINO: The environmental --
4 JUDGE ELLEMAN: Environmental report.
5 MR. TARANTINO: -- environmental report.
6 MR. HAEMER: Judge Karlin, for clarity,
7 it's the Dominion parties, and it's --
8 JUDGE KARLIN: Yes, thank you. That's
9 good.
10 JUDGE ELLEMAN: Did I have the page right?
11 Does that contain a plot of --
12 MR. TARANTINO: Yes, it is the
13 environmental radiation TLDs --
14 JUDGE ELLEMAN: Yes.
15 MR. TARANTINO: -- draft from January '86
16 through January of '05.
17 JUDGE ELLEMAN: I think you're looking at
18 the right one. Do you see the big drop in doses there
19 in the --
20 MR. TARANTINO: One in January of '01.
21 JUDGE ELLEMAN: Yes, it looks like about
22 there.
23 MR. LEWIS: Judge Elleman, if Mr.
24 Tarantino can't answer, Mr. Breeden can.
25 JUDGE ELLEMAN: Okay.

1 MR. LEWIS: If you --

2 MR. TARANTINO: If I could just read, if

3 you don't mind, just to --

4 JUDGE ELLEMAN: Sure. No, go ahead.

5 (Pause.)

6 MR. TARANTINO: I was just seeing if there

7 was an explanation or discussion of what was going on

8 there. I would request if -- I can't answer the

9 question. I don't know. You can ask --

10 JUDGE KARLIN: Do you think you have

11 another witness available?

12 MR. TARANTINO: Yes.

13 JUDGE ELLEMAN: Now, well, certainly the

14 change is in a positive direction.

15 MR. TARANTINO: Right. I just don't

16 know --

17 MR. BREEDEN: The plant that takes --

18 JUDGE KARLIN: Right. Okay, fine. Could

19 you identify yourself for the record again, sir?

20 MR. BREEDEN: James Breeden, Health

21 Physicist, North Anna Power Station, formerly

22 Supervisor, Radiological Analysis.

23 JUDGE KARLIN: Great. And just want to

24 remind you you've already been sworn in here today, so

25 you're still under oath, sir.

1 MR. BREEDEN: I understand that, Your
2 Honor.
3 JUDGE KARLIN: Great. Okay. Please
4 proceed.
5 MR. BREEDEN: Yes. In I think the year
6 2001 we changed vendors, so our TLD type changed, and
7 we investigated two types. One had a very large
8 variability. The one we chose was more consistent.
9 We reduced the variability. It gave us a lower dose
10 overall, but that wasn't why we chose it. It was due
11 to the variability or the smaller variability of that
12 vendor's TLD.
13 JUDGE ELLEMAN: So it is an artifact of
14 the organization doing the monitoring for you, the
15 drop.
16 MR. BREEDEN: Correct. By changing the
17 TLD type there was a change in the reported dose.
18 JUDGE ELLEMAN: That doesn't make you feel
19 particularly good, does it, to see that kind of result
20 coming at you?
21 MR. BREEDEN: Well, it doesn't surprise
22 me, because each manufactures a different type of TLD.
23 They are all certified. The variability -- we chose
24 this particular vendor because they were more
25 consistent in the results. We ran a test for an

1 entire quarter with two different sets of TLDs.

2 JUDGE ELLEMAN: I see. I guess one lesson

3 is if the TLD data are looking bad you need to search

4 for a new analysis organization.

5 MR. BREEDEN: And just for an explanation,

6 if you turn to page 59, you will see that it says two

7 dosimeters may have CaF and LiF. These TLDs replaced

8 the previous calcium sulfate disposed in January of

9 2001.

10 JUDGE ELLEMAN: Okay.

11 MR. BREEDEN: So the explanation is

12 included on page 59.

13 JUDGE KARLIN: And just so we can put it

14 on the record here, could someone define "TLD" for us?

15 MR. BREEDEN: TLD is thermal luminescent

16 device or dosimeter.

17 JUDGE KARLIN: Right. Okay. Thank you.

18 JUDGE ELLEMAN: I have no other questions.

19 JUDGE KARLIN: Okay.

20 JUDGE COLE: Yes, I just have a question,

21 because I'm interested in the subject, on fish

22 ingestion as a critical pathway. How was that

23 selected as the critical pathway, and what does your

24 sampling program look like?

25 MR. TARANTINO: You might be better to

1 answer that.

2 MR. BREEDEN: Yes, I'll speak in general.

3 The analysis done for the various pathways, and then

4 we sample fish twice a year. We analyze it for gamma

5 isotopic iodine. We also collect a sample from Lake

6 Orange as a control sample, which is I believe about

7 20 miles away. It's in the radiological environmental

8 report, so we -- we grab samples twice a year from our

9 lake and twice a year from Lake Orange. And we take

10 a -- what's called a sportsfish and then we also take

11 bottom-dwelling species, catfish.

12 JUDGE COLE: Okay. So you take a variety

13 of the fish in --

14 MR. BREEDEN: That's correct.

15 JUDGE COLE: -- including probably striped

16 bass.

17 MR. BREEDEN: I don't know the type, but,

18 yes, it probably includes striped bass.

19 JUDGE COLE: That's all I have. Thank

20 you.

21 JUDGE KARLIN: All right. I don't have

22 any questions. Do you have anything further?

23 JUDGE ELLEMAN: I don't.

24 JUDGE KARLIN: Mr. Lewis, any clarifying

25 questions?

1 MR. LEWIS: Let me just try one. I think
2 earlier you testified that the calculations of the
3 maximally exposed individual assumes that this
4 individual drinks water essentially from the discharge
5 canal and consumes fish from the same locations. And
6 earlier you heard I think the staff say that MEIs or
7 a maximally exposed individual doesn't move around.
8 Could you just explain that? Am I correct
9 in understanding that you choose one individual and
10 location, but then you assume that that individual
11 consumes water and fish and other food stuffs that
12 come from other worse locations, is that correct?
13 MR. TARANTINO: The maximum exposed
14 individual is the person sitting at the end of the
15 discharge canal, the fisherman putting his line out at
16 the discharge canal in that fixed location. So when
17 we do the fish ingestion pathways for that individual
18 that's getting the fish at that location, not anywhere
19 else in the lake.
20 MR. LEWIS: Thank you. Nothing further.
21 JUDGE KARLIN: Okay.
22 JUDGE COLE: Did you say at the end of the
23 discharge canal?
24 MR. TARANTINO: That is correct. For
25 purposes of the analysis.

1 JUDGE KARLIN: For the fish ingestion.

2 JUDGE COLE: So the plants are -- by the

3 "discharge canal," you're talking about the discharge

4 of the waste heat facility or Lake Anna?

5 MR. TARANTINO: It's at the entrance of

6 the waste treatment facility, entrance into that area.

7 JUDGE COLE: At the entrance into that

8 area.

9 MR. JHA: From the discharge canal.

10 JUDGE COLE: Okay. There might not be

11 very many fish there? Don't they like that warm

12 water? I don't know.

13 MR. BREEDEN: Yes. In fact, they do like

14 the warm water, except in the summer. There's quite

15 a lot of fish there in the winter. In the summer, the

16 oxygen level is of course reduced in the extra heat.

17 JUDGE KARLIN: Is that part of the 50

18 percent variability that --

19 (Laughter.)

20 JUDGE COLE: All right, sir. Thank you.

21 JUDGE KARLIN: All right. I think we've

22 finished this subject. Thank you very much.

23 We are now looking at 4:13. I think what

24 I'd like to propose is we take a short 10-minute break

25 and then -- during which time we can get the staff to

1 bring the witnesses up. I think we have the NEPA
2 alternatives topic. There is no panel being presented
3 by the applicant on that matter, as I understand it.
4 Is that correct, Mr. Lewis?
5 MR. LEWIS: That's correct, sir.
6 JUDGE KARLIN: Okay. And I'm not sure
7 that it will take that long, so hopefully we can plow
8 through and try to get that finished. So let us
9 reconvene at 4:25 by that clock, if we could. We're
10 adjourned.
11 (Whereupon, the proceedings in the
12 foregoing matter went off the record at
13 4:14 p.m. and went back on the record at
14 4:25 p.m.)
15 JUDGE KARLIN: We're back on the record,
16 Mr. Court Reporter.
17 Ms. Poole, did you have something?
18 MS. POOLE: One quick item, if I may. Mr.
19 Cushing, who is on this panel, has a correct to his
20 statement of professional qualifications and
21 affidavit. They appear as Staff Exhibits -- part of
22 Staff Exhibits 11 and 13.
23 JUDGE KARLIN: Okay.
24 MR. CUSHING: Your Honor, I'm the Project
25 Manager for the environmental impact statement for the

1 early site permit.

2 JUDGE KARLIN: Maybe what I would do is

3 have them -- you all sworn in, and then we'll start --

4 some of you have already testified, but we want to do

5 this en mass, so if you could raise your right hands.

6 (Whereupon, the panel was sworn.)

7 Great. Thank you. Please be seated. Mr.

8 Cushing, go ahead now.

9 MR. CUSHING: Yes. I'm the Project

10 Manager for the North Anna early site permit

11 environmental impact statement. And since the

12 reorganization, I am now in the Office of Nuclear

13 Reactor Regulation, the Division of Operating Rector

14 Licenses, as a Senior Project Manager.

15 JUDGE KARLIN: All right. Great.

16 Well, this is one of those where we didn't

17 ask for a presentation and just had a few questions,

18 really. So that's how we'll approach it.

19 I'd like to ask you to turn to the final

20 environmental impact statement discussion of the

21 alternatives, which I understand begins on page 8.1,

22 impact of alternatives.

23 Mr. Cushing, perhaps you could tell me the

24 breakdown of the witnesses here. I mean, who should

25 I address my questions to in terms of alternatives

first, do you think? How does everyone fit into this situation? Maybe you could just tell me that.

MR. CUSHING: Okay. I'll be addressing mitigation. Mr. Kugler will be addressing the process for alternative site selection and alternative sites. Lance Vail will be addressing plant design systems for water. And Mary Ann Parkhurst will be assisting us in all of these areas.

JUDGE KARLIN: Okay. Okay, great. So Mr. Kugler will be alternatives sites, Mr. Vail will address alternative design, process design.

MR. CUSHING: Yes, specifically to the cooling water.

JUDGE KARLIN: Okay. That's helpful.

Well, Mr. Cushing, perhaps I could just start with you. As I understand it, the environmental impact statement has -- covers the no action alternative as we see on page 8.1.

MR. CUSHING: That is correct.

JUDGE KARLIN: And then, on page 8.2, system design alternatives are covered.

MR. CUSHING: That's correct.

JUDGE KARLIN: And that's the area that Mr. Vail would be helping us with perhaps.

MR. CUSHING: Yes.

1 JUDGE KARLIN: And then, on page 8.5
2 begins a discussion of alternative sites, region of
3 interest, and selection and evaluation process with --
4 Mr. Kugler would be the one? All right.
5 Let me focus on the alternative sites,
6 page 8.5. Mr. Kugler, perhaps you could be helping us
7 with this. Are you familiar with the staff -- well,
8 let me back up. On page 8.8 of the final
9 environmental impact statement at the top of the page,
10 there's a discussion of the region of interest and
11 saying that Dominion used the candidate site criteria
12 identified by NRC 2000. Could you -- can you tell me
13 what that is?
14 MR. KUGLER: Yes, Your Honor. NRC 2000 is
15 the environmental standard review plan, and in this
16 particular case they'd be referring to the ESRP
17 Section 9.3, which is the section for alternative
18 sites.
19 JUDGE KARLIN: All right. Yes. And
20 that's NUREG-1555?
21 MR. KUGLER: Correct, Your Honor.
22 JUDGE KARLIN: All right. Okay. Well,
23 I'm going to ask you a few questions about that NUREG-
24 1555, if I may.
25 MR. KUGLER: Okay.

1 JUDGE KARLIN: Do you have that in front
2 of you, or do you have it memorized?
3 MR. KUGLER: Actually, that document I
4 don't have.
5 JUDGE KARLIN: Is this one you have
6 memorized?
7 (Laughter.)
8 MR. KUGLER: I'm working on it.
9 JUDGE KARLIN: Yes, okay. If you could
10 get -- pull that out. I'm not sure whether that's an
11 exhibit.
12 MS. POOLE: It has not been identified as
13 an exhibit.
14 JUDGE KARLIN: Okay.
15 MS. POOLE: No, Your Honor.
16 MR. KUGLER: Yes, we do have it here.
17 JUDGE KARLIN: Okay. Great. Now, if
18 you'll refer to the first section, 9.3-1, I guess page
19 actually, could you give me the definition of what the
20 region of interest is?
21 MR. KUGLER: Well, it's defined in the
22 environmental standard review plan. It's the
23 geographic area that's used in searching for candidate
24 sites.
25 JUDGE KARLIN: All right. And in this

1 case, what was the region of interest that was used in
2 this ESP alternative site analysis?
3 MR. KUGLER: There was a fairly broad
4 range of interests used by Dominion in its search in
5 this case. They looked at the midwest, northeast, and
6 mid-Atlantic portions of the United States. I think
7 if you look at the diagram that they used to describe
8 their range of interest it's really a function of
9 transmission system areas.
10 There are different regions, the way the
11 transmission system is broken up in the United States,
12 and so it's really the boundaries were kind of set
13 along those -- along those lines.
14 JUDGE KARLIN: All right. Are you
15 familiar with, I presume, the environmental report
16 submitted by the applicant on this issue?
17 MR. KUGLER: Yes, Your Honor.
18 JUDGE KARLIN: And if I refer to -- and
19 that's an exhibit in this proceeding -- I'm not sure
20 which -- Figure 9.3-1, region of interest. Is it the
21 orange area covered by this report?
22 MR. KUGLER: Yes, Your Honor, it is. I
23 believe that's correct. Let me see if I can take a
24 look at that. Well, my version is not in color, but
25 I believe that is correct.

1 JUDGE KARLIN: All right. And does it
2 cover west of the Mississippi River in some states and
3 regions?
4 MR. KUGLER: Yes, it does, Your Honor.
5 JUDGE KARLIN: And it's a pretty large
6 area. What percentage of the United States does that
7 represent?
8 MR. KUGLER: We didn't calculate a
9 percentage.
10 JUDGE KARLIN: Would it be correct to say
11 -- I think you or the applicant said something in the
12 excess of 25 percent of the land mass of the United
13 States.
14 MR. KUGLER: It looks to be that size,
15 yes.
16 JUDGE KARLIN: Okay. Pretty large region
17 of interest, would you say?
18 MR. KUGLER: Yes, Your Honor.
19 JUDGE KARLIN: Yes. Okay. And back to
20 the NUREG-1555. Please give me the definition of
21 "candidate sites" from page 9.3-1, candidate sites.
22 MR. KUGLER: Candidate sites are those
23 sites, at least four, that are within the region of
24 interest and that are considered in the comparative
25 evaluation of sites to be among the best that can

1 reasonably be found for the siting of a nuclear
2 powerplant.
3 JUDGE KARLIN: Okay. And please give me
4 the definition of "alternative sites."
5 MR. KUGLER: Alternative sites are those
6 candidate sites that are specifically compared to the
7 proposed site to determine if there is an obviously
8 superior site.
9 JUDGE KARLIN: And what's the difference
10 between a candidate site and an alternative site?
11 MR. KUGLER: Really, the only difference
12 is the -- if you have a list of candidate sites, it
13 includes both the alternative sites and the proposed
14 site. So it's the full list. And when you determine
15 what your proposed site is going to be, then what
16 you're left with is the proposed and the alternatives.
17 JUDGE KARLIN: Well, if you take the
18 definition of "candidate sites," it's within the
19 region of interest -- those sites to be among the best
20 that can reasonably be found for the siting of a
21 nuclear powerplant within the region of interest. Is
22 that right?
23 MR. KUGLER: That's correct, Your Honor.
24 JUDGE KARLIN: And my question -- one of
25 my questions is, how did you determine that the three

1 alternative sites considered here -- how did you get
2 -- what candidate sites did you consider in looking at
3 -- you have a very large region of interest. What are
4 the best sites that could reasonably be found within
5 that very large area?
6 MR. KUGLER: For our evaluation, we looked
7 at four candidate sites, including the proposed site
8 and three alternatives. The proposed site of
9 course --
10 JUDGE KARLIN: Could you explain to me in
11 the FEIS where you looked at four candidate sites?
12 Candidate sites.
13 MR. KUGLER: I'm not certain we used the
14 term in the EIS. Let's see.
15 JUDGE KARLIN: But isn't that required by
16 NUREG-1555, you go from region of interest to a group
17 of candidate sites within that region, down to the
18 alternative sites?
19 MR. KUGLER: Yes, Your Honor. And we did
20 that. I'm not sure if the words in the document are
21 fully reflective of it. That's what I'm trying to
22 remember -- if we used the term or not.
23 JUDGE KARLIN: Well, let's go to page 8.7
24 of the final environmental impact statement.
25 Dominion's region of interest -- there it lays out the

1 ROI, and you state, "In its ESP application, Dominion
2 selected its ROI, and it included the mid-Atlantic,
3 northeast, and midwest regions of the United States."
4 Let's move to page 8.8. Within -- at the
5 top, "Within this ROI, Dominion used the candidate
6 site criteria identified by NRC, NRC 2000." That's
7 NUREG-1555, correct?
8 MR. KUGLER: Yes, Your Honor.
9 JUDGE KARLIN: To identify candidate
10 sites. Can you show me where they did that? First of
11 all, show me, what are the candidate site criteria?
12 It says, "Dominion's site criteria can be found in
13 NUREG-1555." Candidate site criteria.
14 MR. KUGLER: Yes, Your Honor.
15 JUDGE KARLIN: When I looked at it, I
16 didn't see anything that clearly -- maybe candidate
17 site criteria. I see that the definition of
18 "candidate sites" says it must be both sites to be
19 among the best that can be reasonably found for the
20 siting of a nuclear powerplant within the region of
21 interest. Is that the -- are those the criteria?
22 MR. KUGLER: Well, I believe what it's
23 really referring to is starts on the bottom of
24 page 9.3-7, and it's talking about our review of the
25 analysis procedure. And it says, "The reviewer should

1 consider the following topics addressed by the
2 applicant," and it's talking about the issues that we
3 would look at for each site.
4 And it's talking about, you know, the
5 major issues -- hydrology, water quality, obviously,
6 aquatic biological resources, terrestrial resources,
7 transmission corridors. These are the issues that
8 need to be reviewed.
9 It also is included in Table 9.3-1. I
10 think it's addressing many of those same issues. It
11 is on page 9.3-15.
12 JUDGE KARLIN: Subject areas for candidate
13 site selection and screening. Okay. Topic areas for
14 evaluation of alternative sites.
15 Can you go to page 9.3-7? I think we've
16 got the same pagination here, but at the top paragraph
17 the last sentence of that paragraph seems to say, "All
18 nuclear powerplant sites within the identified region
19 of interest having an operating nuclear powerplant or
20 construction permit issued by the NRC should be
21 compared with the applicant's proposed site."
22 MR. KUGLER: Yes, Your Honor.
23 JUDGE KARLIN: Did you do that?
24 MR. KUGLER: No, Your Honor, we did not,
25 and I'll explain why. There is a Commission decision

1 that was made, I believe in 1977. There was an issue
2 raised -- I'm thinking it may have been on Seabrook --
3 and the question that was raised by an intervenor was,
4 couldn't they build it at this other site that's owned
5 by another utility, because that site might be better,
6 shouldn't they have considered that site?
7 And the Commission responded that it was
8 not considered reasonable to consider sites that are
9 owned by another utility as alternative site. The
10 basic reasoning was that the -- we have an application
11 from this applicant to build a nuclear powerplant.
12 This applicant could not reasonably expect to be able
13 to build a nuclear powerplant on a site owned by
14 another utility.
15 JUDGE KARLIN: Well, then why does this
16 document, which is dated 2000, say that you have to
17 consider all nuclear powerplants within the region of
18 interest?
19 MR. KUGLER: Well, we are in the process
20 of updating the environmental safety plan right now.
21 That's actually one of the things they've considered
22 changing.
23 JUDGE KARLIN: Well, it has been updated
24 since the 1977 decision --
25 MR. KUGLER: Yes, it has. It has, Your

1 Honor.

2 JUDGE KARLIN: -- several times, has it

3 not?

4 MR. KUGLER: I don't know about several

5 times. I know of once that it has been updated.

6 JUDGE KARLIN: Well, I'm looking at a 1999

7 version, October '99. Is that the one you're using?

8 MR. KUGLER: Yes, Your Honor.

9 JUDGE KARLIN: Okay. So it was at least

10 updated then, wasn't it?

11 MR. KUGLER: Yes. Yes, Your Honor.

12 JUDGE KARLIN: Okay. But you didn't do

13 that. You didn't do what the reg guide says or the

14 NUREG says to do.

15 MR. KUGLER: Well, we are following the

16 guidance of that Commission decision.

17 JUDGE KARLIN: Can you give me the

18 citation on that decision?

19 MR. KUGLER: I should be able to get it.

20 It looks like this is CLI-77-8, dated March 31, 1977.

21 And it was regarding the Seabrook site.

22 JUDGE KARLIN: Okay. Great. All right.

23 Well, let me go to page 9.3-5 of the NUREG-1555. It

24 seems to say, and I'll quote, "The review procedure

25 involves a two-part sequential test for obvious

1 superiority. The first stage of the test determines
2 whether there are environmentally-preferred sites
3 among the candidate sites. The second stage of the
4 test considers economic, technological, and
5 institutional factors among the environmentally-
6 preferred sites."
7 I want to focus on the first state of the
8 test -- to determine whether there are
9 environmentally-preferred sites among the candidate
10 sites. Now, what were the candidate sites?
11 MR. KUGLER: The candidate sites were
12 North Anna and Surry, two sites that are owned by
13 Dominion. And the Savannah River site in South
14 Carolina, and the Portsmouth site in Ohio. These are
15 DOE sites with land available.
16 JUDGE KARLIN: All right. And are you
17 saying that those are the best -- the best that can
18 reasonably be found for the siting of any nuclear
19 powerplant in that region of interest?
20 MR. KUGLER: That was our conclusion, Your
21 Honor.
22 JUDGE KARLIN: On what basis did you reach
23 that conclusion? And where is it written in the FEIS?
24 MR. KUGLER: Okay. In part, the basis is
25 that if you look in the environmental standard review

1 plan, this is on page 9.3-6, item number 8, starting
2 near the bottom, if the pagination is the same.
3 "Recognize that there will be special cases in which
4 the proposed site was not selected on the basis of the
5 systematic site selection process.
6 "Examples include plants proposed to be
7 constructed on the site of an existing nuclear
8 powerplant previously found to be acceptable on the
9 basis of NEPA review and/or demonstrated to be
10 environmentally satisfactory on the basis of operating
11 experience, and sites assigned or allocated to the
12 applicant by the state government."
13 Okay. The situation we have here -- and,
14 actually, this is a similar situation with the other
15 early site permits -- is the use of the existing sites
16 as primary sources of candidate sites.
17 JUDGE KARLIN: Well, let me just cut in
18 there. I mean, I was -- that's good. I understand
19 that this is a case where the proposed site is where
20 an existing nuclear powerplant is located.
21 So let's read the next sentence. "For
22 such cases, the reviewer should analyze the
23 applicant's site selection process only as it applies
24 to candidate sites other than the proposed sites." So
25 I understand how they came up with the proposed site.

1 What I still don't understand is how you looked at all
2 of the other candidate sites. That does not say you
3 have to limit the candidate sites to ones that are
4 owned by this applicant and/or that -- in fact, you
5 didn't do that. You have others.
6 So my question remains, are you saying
7 that that's the basis for you only looking at sites
8 owned by the applicant?
9 MR. KUGLER: The approach that we took in
10 this review is that we had -- the applicant has to
11 identify a reasonable slate of sites. The
12 environmental standard review plan indicates a
13 reasonable slate of sites would be three to five
14 sites.
15 JUDGE KARLIN: And those are the
16 alternative sites.
17 MR. KUGLER: Right. Three to five
18 alternative sites.
19 JUDGE KARLIN: Let's start with the
20 candidate sites, and let's remember that NEPA is an
21 obligation on you, the agency, not the applicant.
22 MR. KUGLER: Correct.
23 JUDGE KARLIN: I want to understand what
24 you did to determine what the candidate sites were
25 within the region of interest.

1 MR. KUGLER: While the -- NEPA is an
2 obligation on the staff. The approach that was used
3 in the ESRP is to review the process used by the
4 applicant, and determine whether they have used a
5 reasonable process to identify candidate sites, to
6 identify the proposed site and the alternatives, and
7 then to compare those sites. And that's the approach
8 that we took.
9 We used the slate of sites that the
10 applicant had identified. We determined that the
11 process that they used to identify those sites was
12 reasonable, that the slate of sites was reasonable.
13 And then, we evaluated the environmental -- we
14 evaluated the environmental impacts at the proposed
15 alternative sites, and we formed an independent
16 comparison of those sites to determine whether any was
17 environmentally preferable to the proposed site.
18 JUDGE KARLIN: All right. Well, let's go
19 to the FEIS again, page 8.7. This Section 8.3.1, you
20 talk about Dominion's region of interest.
21 MR. KUGLER: Okay.
22 JUDGE KARLIN: No, on page 8.8, you say,
23 "Staff concludes that the ROI used by Dominion in its
24 ESP application is appropriate." Okay? So you found
25 their ROI to be appropriate. It's a big ROI, and you

1 found it to be appropriate.

2 Let's go to the next section, 8.3.2,

3 Dominion's alternative site selection process.

4 Dominion evaluated its proposed site and the three

5 alternative sites using the 45 site suitability

6 screening criteria.

7 Where is the section on candidate sites?

8 You jumped from ROI to alternative sites. Where is

9 your analysis of candidate sites, i.e. those sites

10 which are the best reasonably available

11 environmentally within that region of interest?

12 MR. KUGLER: Well, Your Honor, the way we

13 documented it in the environmental impact statement --

14 if you can give me just a moment, please.

15 JUDGE KARLIN: Sure.

16 (Pause.)

17 MR. KUGLER: Your Honor, when we -- we

18 discuss the candidate sites on pages 8.6 and 8.7 of

19 the FEIS. I've got to admit, the way we state it in

20 the EIS, we don't clearly state that we have done an

21 evaluation of the candidate sites, but that is what

22 this section was attempting to document, that we had

23 taken a look at the approach that was used, the set of

24 sites that Dominion identified as candidate sites, and

25 determined that that was a reasonable slate of

1 candidate sites for us to work from.

2 But we don't make a clear statement about

3 that in the environmental impact statement. So I can

4 understand why you're questioning that.

5 JUDGE KARLIN: Well, I see on page 8.6,

6 for example, the first full paragraph, "This section

7 includes subsections discussing Dominion's region of

8 interest for selecting alternative sites. The three

9 alternative sites examined in detail on this EIS are

10 Dominion Surry Power, DOE Portsmouth, DOE Savannah

11 River." So that's jumping straight to alternatives as

12 well, it seems.

13 Dominion stated that the two DOE sites met

14 the following because, blah, blah, blah. So there's

15 a whole lot of what Dominion stated. I don't see a

16 whole lot of what the NRC is thinking or doing or

17 analyzing.

18 MR. KUGLER: Well, that last paragraph in

19 that section, just before the beginning of 8.3.1,

20 talks about our views on what they had done.

21 JUDGE KARLIN: Right.

22 MR. KUGLER: But, again, we did not

23 clearly state it in the terms of us looking at it for

24 candidate sites.

25 JUDGE KARLIN: So are you referring to the

1 paragraph on page 8.7, "The NRC's environmental review
2 guidance for alternatives"?
3 MR. KUGLER: Yes, Your Honor.
4 JUDGE KARLIN: And it says there will be
5 special cases, and in your -- and you're referring
6 basically to the part of NUREG-1555 that we just
7 talked about, right?
8 MR. KUGLER: Yes, Your Honor.
9 JUDGE KARLIN: All right. When the
10 proposed site was not selected -- the proposed site
11 was not selected on the basis of a systematic site
12 selection, but was selected on the basis of something
13 else. It was previously found acceptable.
14 In such cases, the NRC would analyze the
15 applicant's site selection process only as it applies
16 to alternative sites. That really isn't what the
17 NUREG says. I think it says that you don't have to
18 challenge the proposed site, but you still have to go
19 through both the candidate site and the alternate site
20 analysis. But --
21 MR. KUGLER: Yes, I believe that's
22 correct, Your Honor.
23 JUDGE KARLIN: Okay. Let me go to page
24 8.8, where then -- we jump from, as I think we pointed
25 out before, you jumped from saying the ROI is

1 reasonable to then now Dominion's analysis of its
2 alternative sites.
3 And Dominion evaluated the proposed North
4 Anna ESP site and the three alternative sites using 45
5 site suitability screening criteria. The criteria are
6 grouped in four groups -- economic, engineering,
7 environmental, and socioeconomic. Are those the
8 criteria that should be used to evaluate whether
9 something is a candidate site? Or isn't a candidate
10 site supposed to be the environmentally preferable
11 best among the ROI?
12 MR. KUGLER: I'm trying to remember the
13 exact wording in the environmental standard review
14 plan. But -- well, the environmental standard review
15 plan doesn't really differentiate between
16 environmentally or other issues. It just states --
17 and this is back on page 9.3-1, "The candidate sites
18 are considered" -- let's see -- "to be among" --
19 JUDGE KARLIN: Let's go to the chart on
20 page 9.3-1, table, selection of candidate sites. I
21 mean, those -- that doesn't include economic --
22 MR. KUGLER: Well, actually --
23 JUDGE KARLIN: -- socioeconomic, including
24 aesthetics.
25 MR. KUGLER: But it looks at facility

1 costs.

2 JUDGE KARLIN: Facility costs.

3 MR. KUGLER: Institutional constraints,

4 public concerns.

5 JUDGE KARLIN: Engineering. Okay. Well,

6 we're dealing with 45 site suitability screening

7 criteria that they use to evaluate -- and that you

8 looked at. I mean, this responsibility is on NRC, not

9 on them.

10 MR. KUGLER: Yes, sir.

11 JUDGE KARLIN: Forty-five criteria that

12 were used to evaluate the proposed site against the

13 three alternative sites. Is that right?

14 MR. KUGLER: Those are the criteria that

15 Dominion used. That's correct.

16 JUDGE KARLIN: All right. And what are

17 the criteria you used?

18 MR. KUGLER: Well, in order for us to --

19 for our evaluation, in looking at the alternative

20 sites versus proposed site, the environmentally

21 preferable test really only includes environmental

22 impacts. So, for instance, it would not include costs

23 of facility, institutional concerns, things of that

24 nature. It focuses just on environmental.

25 And so starting in Section 8.2 -- 8.3.3 at

1 the bottom of page 8-8, we talk about the staff's
2 evaluation of the alternative sites, because we -- the
3 evaluation that Dominion performed -- and this is
4 documented in their 2002 report that they developed
5 with Bechtel under DOE auspices -- they did consider
6 factors that were economic, institutional, things like
7 that.
8 So as they developed their proposed
9 alternative sites, they were considering factors that
10 would not be involved in the determination whether an
11 alternative site was environmentally preferable. So
12 when we performed our evaluation, we focused just on
13 the environmental impacts to make that determination.
14 JUDGE KARLIN: But only within the
15 universe of the three alternative sites they gave you.
16 MR. KUGLER: That's correct, Your Honor.
17 JUDGE KARLIN: And those are the only ones
18 you compared against and among that universe or
19 cohort.
20 MR. KUGLER: Those are the only ones we
21 compared. There was an additional alternative site in
22 the original evaluation they did, but it was outside
23 the final region of interest that they determined.
24 JUDGE KARLIN: Which one was that?
25 MR. KUGLER: That's Idaho National

1 Laboratory site.

2 JUDGE KARLIN: Okay.

3 MR. KUGLER: They considered it back in

4 2002.

5 JUDGE KARLIN: Well, you considered

6 Millstone, didn't you, because they own Millstone?

7 MR. KUGLER: We did look at it. It was

8 not considered a good candidate site, because of its

9 location, the size of the site. There are some issues

10 with that particular location in terms of population,

11 nearby recreational areas, things of that nature.

12 JUDGE KARLIN: Okay. Did you, within the

13 region of interest, consider -- how many power reactor

14 sites or powerplant sites does Dominion have within

15 that region of interest? Not just nuclear power but

16 powerplants.

17 MR. KUGLER: I'm not sure of the number.

18 I only looked at --

19 JUDGE KARLIN: Have you looked at that?

20 MR. KUGLER: I only looked at that one

21 time. I looked at it one time, but --

22 JUDGE KARLIN: Is that discussed in the

23 FEIS?

24 MR. KUGLER: No, it is not, Your Honor.

25 JUDGE KARLIN: Why not?

1 MR. KUGLER: The --

2 JUDGE KARLIN: Were any of those possibly
3 environmentally preferable? How many are we talking
4 about, three or four or a dozen?

5 MR. KUGLER: It depends on the size of the
6 site you're talking about. They own a large number of
7 powerplant sites. Some of them are quite small,
8 however. But in following the guidance within the
9 ESRP, we don't -- we're not required to identify all
10 of the possibilities. We do have to come up with a
11 reasonable slate of sites that --

12 JUDGE KARLIN: Yes, all reasonable
13 alternatives. That doesn't mean all 100 of them, but
14 a representative sampling of the environmentally best
15 and preferable sites within a reasonable spectrum.

16 MR. KUGLER: That's correct, Your Honor.

17 JUDGE KARLIN: And this spectrum somehow
18 jumped immediately to Surry and two DOE sites. And
19 that's all you looked at.

20 MR. KUGLER: That is all we reviewed, yes,
21 Your Honor.

22 JUDGE KARLIN: How about -- so you did not
23 look at -- or did you look at other powerplant sites
24 owned by Dominion or its other associated companies?

25 MR. KUGLER: No, we did not, Your Honor.

1 JUDGE KARLIN: Did you look at other
2 powerplant sites owned by other companies?
3 MR. KUGLER: No, we did not, Your Honor.
4 And that -- that's --
5 JUDGE KARLIN: You looked at sites that
6 were owned by DOE.
7 MR. KUGLER: Yes, Your Honor. DOE is not
8 a competitor with Dominion for power production. And,
9 indeed, the DOE sites we were looking at were
10 interested in obtaining new missions.
11 JUDGE KARLIN: Are you sure that some
12 other nuclear sites within the area might not have
13 wanted to work a deal with Dominion?
14 MR. KUGLER: I cannot be certain of that.
15 But having --
16 JUDGE KARLIN: Now, is Dominion Nuclear
17 North Anna the same company as VEPCO, who owns this
18 site?
19 MR. KUGLER: Dominion Nuclear North Anna
20 is a subsidiary of Dominion Resources, Incorporated.
21 JUDGE KARLIN: Right.
22 MR. KUGLER: As is VEPCO. They are both
23 subsidiaries.
24 JUDGE KARLIN: All right. So they're
25 separate legal entities.

1 MR. KUGLER: That's my understanding, Your
2 Honor.
3 JUDGE KARLIN: Okay. Okay. Did you look
4 at any other federally-owned facilities or -- than the
5 large region of interest we're talking about, not just
6 DOE sites?
7 MR. KUGLER: No, Your Honor. We looked at
8 these -- this group of four, once we determined that
9 we felt that that was a reasonable slate.
10 JUDGE KARLIN: Well, I'm still trying to
11 figure out how you figured they were a reasonable
12 slate. There's a step missing, isn't there? I mean,
13 that's -- I guess we're going over the same ground.
14 How do you get from a region of interest to these
15 three alternatives?
16 I mean, I would propose to you that if I
17 had a proposed site A, and if you give me the ability
18 to select the three alternative sites against which A
19 needs to be compared, I can rig that game very quickly
20 so that you would have to pick A.
21 MR. KUGLER: Yes, you could. And
22 that's --
23 JUDGE KARLIN: How do you know that didn't
24 happen?
25 MR. KUGLER: That was part of our review.

1 We took a --

2 JUDGE KARLIN: What other sites did you

3 look at?

4 MR. KUGLER: We took a look at the process

5 they use, and we look at -- took a look at the

6 candidates that they came up with.

7 JUDGE KARLIN: Well, you compared the four

8 units among the criteria they gave you, right? And I

9 suggest that if I give you the criteria, and I give

10 you the three alternatives, I can always get you to

11 select the one I want.

12 MR. KUGLER: We did not use their

13 criteria. That was part of their review, Our review

14 -- we took a different approach. As I indicated, some

15 of their criteria were not of the type that we would

16 include in the evaluation for an environmentally

17 preferable site.

18 JUDGE KARLIN: Okay.

19 MR. KUGLER: So when we looked to

20 determine whether or not any of the alternative sites

21 was environmentally preferable, we did that

22 independently of the work they had done. We visited

23 all of these alternative sites. We spoke with the

24 site operators, we gathered information in the local

25 area. We also, obviously, gathered a lot of

1 information that's available now on the web, and
2 through other sources, to determine what the
3 environmental impacts would be at any of these sites.
4 JUDGE KARLIN: "Any of these sites" being
5 the Surry site and the two DOE sites?
6 MR. KUGLER: That's correct, Your Honor.
7 JUDGE KARLIN: And that's all.
8 MR. KUGLER: Yes, Your Honor.
9 JUDGE KARLIN: Okay.
10 MR. KUGLER: Now, one thing I will say, I
11 mean, in looking at this we were looking to make sure
12 that the sites that have been put forward as
13 candidates were strong candidate sites. And in the
14 end, we found that any of these sites could hold a new
15 nuclear powerplant. Any of them would be viable
16 options.
17 JUDGE KARLIN: Are you saying that those
18 are the best that could reasonably be found for siting
19 of a nuclear powerplant on an environmental basis
20 within that region of interest? Those are the best
21 three that you could find, that anybody could find?
22 MR. KUGLER: That was our conclusion, yes,
23 Your Honor.
24 JUDGE KARLIN: Okay. Well, it's not in
25 the report, and it's certainly -- there's no

1 explanation for that in the EIS.

2 Let me switch to Mr. Vail I guess on the

3 system design alternatives. This is perhaps a little

4 quicker. Let's go to page 8.2. We talked about this

5 a bit yesterday, and it may come in again. System

6 design alternatives -- on page 8.2, you say -- the

7 staff says, "A dry cooling tower has been proposed for

8 Unit 4 at North Anna site." And you then accept that

9 I believe ultimately as the -- without looking at any

10 other alternatives, as the appropriate result for

11 Unit 4. Is that correct? Dry cooling, no design

12 alternatives for Unit 4.

13 MR. VAIL: No, Your Honor. I mean, we

14 considered other -- you know, for instance, once-

15 through and wet towers and wet-dry hybrid. The basis

16 for the decision was is that we had analyzed when we

17 considered Unit 3 -- Unit 3 is wet cooling -- and

18 determined that that would be unacceptable.

19 If we added another unit, the cumulative

20 effect for Units 3 and 4 once we had Unit 3 in as a

21 hybrid system, the cumulative effects would have put

22 us basically out to the level of a wet unit for Unit

23 -- the combined impact of Unit 4 -- the combined

24 impact would be the same as a wet for Unit 3. And so,

25 therefore, we didn't explicitly simulate that one,

1 but, you know, we certainly gave it consideration.
2 But we realized early on that we were water limited.
3 JUDGE KARLIN: Well, okay. Could you
4 point me to the section of the FEIS where you
5 discussed system design alternatives to dry cooling
6 for Unit 4?
7 MR. VAIL: Well, the -- in that paragraph
8 that you're referring to --
9 JUDGE KARLIN: Right.
10 MR. VAIL: -- I think it's the third or
11 fourth sentence. It says, "Water energy balance
12 studies for Lake Anna suggests that it would be
13 difficult for the lake to support once-through cooling
14 system, a wet cooling tower heat dissipation system,
15 or a combined wet-dry cooling system for Unit 4."
16 JUDGE KARLIN: So you rejected a wet-dry
17 cooling system for Unit 4 and found dry cooling to be
18 preferable.
19 MR. VAIL: Correct, because that would
20 have been nearly equivalent to having a wet with
21 Unit 3 and a dry Unit 4.
22 JUDGE KARLIN: Well, you can see where I'm
23 going perhaps, which is, okay, with regard to Unit 3,
24 why did you not find dry cooling to be environmentally
25 preferable for Unit 3 also?

1 MR. VAIL: Well --

2 JUDGE KARLIN: You found it -- it seems to
3 be inconsistent. For Unit 4, you're saying dry
4 cooling is a preferable alternative. For Unit 3,
5 you're saying, oh, no, dry cooling is not appropriate;
6 wet and dry cooling is appropriate. Why isn't what's
7 good for the goose good for the gander? Aren't they
8 both -- if what's environmentally preferable for dry
9 is the best for 4, isn't dry the best for 3?

10 MR. VAIL: Well, we're looking at it
11 incrementally, and we basically put 3 on the site and
12 basically said before we considered 4 at all, before
13 putting a 4 on there, we basically looked at the wet-
14 dry cooling system. Then, if you add anything
15 incrementally that results in a significant water use,
16 which would be anything other than a dry system, you
17 would push it over that threshold.

18 JUDGE KARLIN: So you're sort of using the
19 lake and the maximizing -- or using the most water you
20 can out of the lake before you have to turn to the dry
21 cooling.

22 MR. VAIL: Correct.

23 JUDGE KARLIN: Do you think that's
24 appropriate from an environmental perspective?

25 MR. VAIL: Well, I think, you know, again,

1 we have to look at it as not two units in isolation.
2 It's the cumulative -- the cumulative system, and
3 so --
4 JUDGE KARLIN: Okay.
5 MR. VAIL: -- the only option for Unit 4
6 was to put it as a dry system, acknowledging the fact
7 that dry cooling systems do have some efficiency
8 impacts as well as some fuel cycle impacts.
9 JUDGE KARLIN: Okay. So if we want to
10 look at the cumulative impact -- that's a good segue
11 -- let's talk about Units 1 and 2. Did you look at
12 any offsetting mechanisms for Units 1 and 2 to offset
13 the additional nominal impacts that are going to be
14 imposed by Units 3 and 4?
15 MR. VAIL: Units 1 and 2 operation --
16 continued operation were considered the baseline.
17 JUDGE KARLIN: Yes, I understand. Did you
18 look at any alternatives that would involve imposing
19 some additional requirements on Units 1 and 2 to trade
20 off against the incremental cumulative impacts of 3
21 and 4?
22 MR. VAIL: No.
23 JUDGE KARLIN: No. Okay. They're the
24 same company, you're saying, essentially?
25 MR. VAIL: I'm saying that I'm not going

1 to say --

2 JUDGE KARLIN: Yes, okay.

3 (Laughter.)

4 Okay. I think that's all I've got. Just

5 let me check one thing here. I think that's all the

6 questions I have at the moment.

7 Judge Cole?

8 JUDGE COLE: Yes, I've got a short

9 question. It has to do with the Surry evaluation. We

10 asked a question on -- environmental question 124

11 concerning the Surry analysis. That was answered by

12 Mr. Masnik. I think he's sitting in the back over

13 there, but he might not need to participate in this.

14 I'm looking at the EIS, page 8-17 through

15 8-40, is a summary of the evaluation of the Surry

16 powerplant site. And on page 8-17 of the FEIS, it

17 says the units would use closed cycle cooling. Does

18 that mean dry cooling?

19 MR. KUGLER: No, Your Honor. We assumed

20 a wet cooling system but closed cycle. There is

21 sufficient water in the area for them to be able to

22 use a wet cooling system without significant

23 environmental impacts. The option of once-through

24 cooling would not have been a good option at that

25 location. There were a couple of issues there related

1 to -- well, actually, there's probably three related
2 to -- I'm sorry, two related to once-through cooling.
3 One is the current EPA regulations on
4 316(b), which is what was discussed in this response.
5 Generally speaking, nuke plants are going to be
6 required to use some sort of closed cycle cooling
7 system, unless they can show that the environmental
8 impacts of a once-through system would not be greater
9 than a closed cycle system.
10 JUDGE COLE: All right, sir.
11 MR. KUGLER: There is --
12 JUDGE COLE: Okay. I think you've
13 essentially answered my question. What confused me
14 was the term "closed cycle cooling," because on page
15 8-24 it says, "The consumptive use of water to support
16 mechanical draft cooling towers for new units would be
17 undetectable relative to the supply available in the
18 estuary." And I thought you were asking for dry
19 cooling here, and then a statement here saying the
20 estuary has plenty of water.
21 MR. VAIL: I'm sorry.
22 MR. KUGLER: No, there is plenty of water,
23 and so we considered a wet cooling tower.
24 JUDGE COLE: All right, sir. Thank you.
25 JUDGE ELLEMAN: I confess to some personal

1 confusion on whether a promising alternative site has
2 to be environmentally superior to the proposed site.
3 Is that a starting assumption or not?
4 MR. KUGLER: No, Your Honor. We expect
5 that the candidate sites are all strong contenders for
6 the building of a new nuclear powerplant. Until you
7 do an evaluation you wouldn't know whether any of them
8 were environmentally preferable.
9 Now, the applicant has already been
10 through a process. They theoretically have looked and
11 they have determined, as far as they can tell, that
12 the proposed site does not have an obviously superior
13 alternative. But we have to do an independent review
14 of that, and so what we did was we developed the
15 environmental impacts for each of the alternative
16 sites, and then we compared the proposed and
17 alternative sites.
18 You know, if you look at the results of
19 the environmental impact statement, all of the sites
20 have some maybe we'll call it defects. There are some
21 areas in which the environmental impacts rise above
22 the level of a small impact to moderate, perhaps large
23 in some cases.
24 And so they all have some issues. And
25 what the staff determined for both construction -- we

1 look at for both construction and operation. The
2 staff determined that while there were differences
3 among the sites that none of those differences were so
4 great that we concluded that any of the alternative
5 sites were environmentally preferable to the proposed
6 site.
7 JUDGE ELLEMAN: So I gather, then, an
8 alternative site, which is a wash environmentally, but
9 might have superior economic advantages to it, that
10 could be viewed as a successful alternative site.
11 MR. KUGLER: Well, we don't really look at
12 it -- for environmentally preferable, for that first
13 step in the test, we don't look at economics.
14 JUDGE ELLEMAN: Right.
15 MR. KUGLER: We only look at environmental
16 impacts. If there are no environmentally preferable
17 alternative sites, then we stop there. You don't go
18 on to the next step, because there's no really --
19 there's no reason to go further. The only reason you
20 go further is if you have environmentally preferable
21 alternative sites. Then, the next step is to look to
22 determine whether any of those is actually obviously
23 superior. And that's when you bring in economics,
24 institutional factors, things of that nature.
25 For example, if the costs of construction

1 at an environmentally preferable site was
2 prohibitively high for some reason, maybe it's -- I
3 don't know, it's up on a mountain top and it's very
4 difficult to get things there, for whatever reason --
5 then, although it's environmentally preferable, we
6 might still determine it's not obviously superior. So
7 that -- it's the second step where we get into
8 economics.
9 JUDGE ELLEMAN: We looked a few minutes
10 ago at the criteria Dominion had used in their
11 screening, and I believe it said they allocated 40
12 percent weight to environmental, 20 percent to
13 economic factors. It sounds like their evaluation
14 would not necessarily require an alternative site to
15 be environmentally superior, that the other factors
16 could outweigh an environmental consideration.
17 MR. KUGLER: I think what you're saying is
18 that they essentially did both steps in one step. Is
19 that more or less what you're saying, that they looked
20 at both environmental impacts and costs?
21 JUDGE ELLEMAN: I'm saying that it sounded
22 to me like they used weighting factors other than
23 environment in looking at the possible alternative
24 site selection.
25 MR. KUGLER: They did look at economic

1 factors as well as environmental in their review. So
2 -- and that's one of the reasons it was important that
3 we do an independent evaluation for environmentally
4 preferable sites, because we only were going to look
5 at environmental factors there.
6 JUDGE ELLEMAN: Why is once-through
7 cooling not a possibility at Surry?
8 MR. KUGLER: Well, as we talked about, one
9 issue is going to be the 316(b) rule from the EPA,
10 which this is -- I'm not sure if you're familiar with
11 it. This is --
12 JUDGE ELLEMAN: I'm not, no.
13 MR. KUGLER: I'm sorry. This is a rule
14 regarding intake structures, and if we need -- we may
15 want to bring Mr. Masnik up, because he has studied
16 this in more detail. It's more in his area.
17 But, in essence, the EPA is trying to
18 force powerplants to -- and other large industrial
19 users of water towards means of withdrawing and using
20 water that are more environmentally friendly. And
21 once-through cooling draws an enormous amount of water
22 out of the body of water that's the source, which
23 means you have a lot more entrainment and a lot more
24 impingements, and those are the primary issues EPA is
25 trying to address with this rule -- are entrainment

1 and impingement of aquatic species.

2 So the rule will tend to drive new users

3 to closed cycle cooling systems or other systems that

4 do not have the environmental impacts of a once-

5 through cooling system.

6 JUDGE ELLEMAN: Okay. I confess I was a

7 bit surprised that for both North Anna and for Surry

8 you came to a conclusion of small for water impact

9 consequences. And we had over the last several days

10 some discussion of a study that is to be carried out

11 on possible downstream effects at North Anna, which

12 wouldn't seemingly be a factor at Surry for the site

13 selection.

14 Are there not any factors that would

15 balance towards Surry in terms of water use for that

16 site?

17 MR. KUGLER: In terms of the amount of

18 available water at Surry, there is certainly a lot

19 more water available there. And I don't believe for

20 -- for North Anna, I believe our finding was small to

21 moderate, small in normal water years, moderate in

22 drought years. So that was one of the areas in which

23 North Anna did not do as well.

24 Surry had other issues. One of the most

25 significant issues was the -- an aesthetic issue,

1 because Surry is directly across the James River from
2 Jamestown and Williamsburg.
3 JUDGE ELLEMAN: Yes.
4 MR. KUGLER: This was an issue that we had
5 to look at really closely, because it -- at first
6 blush you might think, well, aesthetics -- you know,
7 that doesn't sound like much of a big deal. We talked
8 with the Park Service and discussed with them what the
9 impacts would be of building new units over there.
10 Part of the issue -- let me back track.
11 When they built Surry Units 1 and 2, one of the things
12 that they did was they actually sank the containment
13 buildings an additional 50 feet into the ground to
14 reduce their profile to make them less visible across
15 the river.
16 Unfortunately, with at least one of the
17 designs that's within the PPE -- and this is the
18 AP1000 -- it is not possible to sink the containment
19 down into the ground because of location of the hatch.
20 And these containments are quite large. They are much
21 larger than the containments that are there today. So
22 that was one issue -- these containments would
23 definitely be above the tree line.
24 In addition, with the wet cooling towers,
25 you would potentially have issues with visual plumes

1 coming up above the tree line on that side of the
2 river. So this was one of the concerns at Surry. I'd
3 have to go back and look. I'm trying to recall what
4 other issues may have been above a small impact at
5 Surry. I don't recall offhand, but I remember that
6 one because we had to really look at that one closely.
7 JUDGE ELLEMAN: Okay. It sounded, though,
8 like the restriction against sinking the unit into the
9 ground applied to just the one possible candidate
10 reactor. Is that true?
11 MR. KUGLER: As far as I know, yes. I'm
12 not aware of a similar restriction on the other
13 designs, but I can't be certain of that. We knew it
14 existed for this design, and it was within the set of
15 designs that they were considering and which were
16 included within the PPE.
17 JUDGE ELLEMAN: Okay. In the earlier
18 discussion on candidate sites, I gather there were no
19 Dominion-controlled green field sites that were looked
20 at as potential candidate sites.
21 MR. KUGLER: Actually, we did consider
22 green field, as did Dominion. But because the -- if
23 you go to a green field site, you're going to have to
24 clear all the land, you're going to have to construct
25 all the infrastructure that already exists at an

existing site, things like transmission systems, you know, transportation systems potentially, cooling water systems -- at North Anna, and at Surry and the other sites, a lot of that infrastructure was already in place or partially in place.

For instance, for the North Anna site, one of the potential pluses at that site was that there is sufficient transmission capability right now for the two new units without adding any lines. And as we discussed in the environmental impact statement, there would have to be a low flow study eventually to determine exactly which directions they want to send the power.

And based on that study, there is the potential they could have to add an additional line, but that wouldn't be known until the combined license application stage, at which point if they did it would be considered new and potentially significant information for further evaluation.

JUDGE ELLEMAN: Okay. Thank you. That's all the questions I have.

JUDGE KARLIN: All right. Ready for clarifying questions, Ms. Poole?

MS. POOLE: I have a couple of clarifying questions for Mr. Kugler, if I may.

1 JUDGE KARLIN: Sure.

2 MS. POOLE: Mr. Kugler, you spoke a lot --
3 quite a lot about the standard review plan. In
4 considering candidate sites, did you rely on or
5 reference any document or documents that were prepared
6 by Dominion or its contractors when considering
7 candidate sites?

8 MR. KUGLER: Well, we obviously reviewed
9 the alternative site analysis that was performed with
10 Bechtel in 2002.

11 MS. POOLE: This is the study of potential
12 sites -- I'm reading from EIS --

13 MR. KUGLER: Yes.

14 MS. POOLE: -- page 8-8.

15 MR. KUGLER: Right.

16 JUDGE KARLIN: Wait. Where are you
17 reading this from?

18 MS. POOLE: FEIS, the bottom of --
19 beginning of the very bottom line of page 8-8.
20 There's a reference to the study of potential sites
21 for the deployment of new nuclear plants in the United
22 States.

23 JUDGE KARLIN: All right. Let me see.
24 8.8, which is 8.3.3, NRC's evaluation of alternative
25 sites?

1 MS. POOLE: That's correct. That's
2 correct, Your Honor.
3 JUDGE KARLIN: Now, are we using the word
4 "alternative" sites or "candidate" sites?
5 MS. POOLE: Well, this is --
6 JUDGE KARLIN: I don't see "candidate"
7 sites in there.
8 MS. POOLE: Well --
9 JUDGE KARLIN: There's a difference.
10 There's a big difference.
11 (Laughter.)
12 MS. POOLE: Understood. I'm getting to
13 it.
14 JUDGE KARLIN: Yes, I think your question
15 assumed a fact not in evidence, which was that in your
16 consideration of candidate sites did you do X, Y, and
17 Z, and I thought the evidence was that he did not
18 consider candidate sites, he considered alternative
19 sites.
20 MS. POOLE: I wanted to --
21 JUDGE KARLIN: So let's get that --
22 MS. POOLE: -- clarify that point also.
23 JUDGE KARLIN: -- clarified, yes, first.
24 MS. POOLE: Okay. Just to say that's --
25 their reference given in the EIS, Dominion-Bechtel,

1 2002. Okay. Did that document contain a discussion
2 of candidate sites?
3 MR. KUGLER: Yes, it did.
4 MS. POOLE: Okay.
5 JUDGE KARLIN: And which document are you
6 referring to?
7 MR. KUGLER: This is the Dominion-Bechtel
8 study that was done in conjunction with -- or under
9 DOE's auspices in 2002.
10 MS. POOLE: It's referenced in the EIS as
11 Dominion and Bechtel, 2002. The one I just read off.
12 JUDGE KARLIN: It's at the bottom of 8.8,
13 going over to 8.10?
14 MS. POOLE: Going over to 8.10.
15 JUDGE KARLIN: Is that document in
16 evidence?
17 MS. POOLE: It is not. It is referenced
18 in the EIS.
19 JUDGE KARLIN: And the -- so that's the
20 section, NRC's evaluation of alternative sites,
21 because the sites were evaluated -- overview level,
22 all three alternative sites previously have been
23 characterized by their operators, but the basis for
24 these characterizations was not specific.
25 In the study of potential sites for

1 deployment of new plant -- nuclear plants in the
2 United States, Dominion and Bechtel evaluated DOE's
3 site at Portsmouth, Savannah River, and Idaho Falls,
4 along with Surry, and with relation to economic
5 engineering, environmental, and sociological factors,
6 using preliminary, blah, blah. Okay.
7 MS. POOLE: Okay. Is that study publicly
8 available and on ADAMS, Mr. Kugler?
9 MR. KUGLER: Yes, it is.
10 MS. POOLE: Okay.
11 JUDGE KARLIN: You can put it into
12 evidence if you want. It doesn't seem to indicate the
13 FEIS showing these people doing an analysis of
14 candidate sites.
15 MS. POOLE: Understood, Your Honor.
16 Mr. Kugler, was this study, Dominion and
17 Bechtel 2002, similar -- and I'm not saying identical,
18 and I'm not suggesting that you are adopting it as
19 your own, okay? Was this study similar to one that
20 you would have performed had you started from scratch
21 to do a candidate site review as described in the
22 ESRP?
23 MR. KUGLER: I'd have to say portions of
24 it are. Again, as we discussed, they did consider
25 economic factors from the outset, which we would not.

1 MS. POOLE: Okay.

2 MR. KUGLER: Actually, I'm sorry, I've got

3 to correct myself. I'm thinking in terms of

4 alternatives.

5 MS. POOLE: All right.

6 MR. KUGLER: At the candidate site stage,

7 you do look at cost. You do --

8 MS. POOLE: Okay.

9 MR. KUGLER: -- consider cost for that.

10 MS. POOLE: Because the section you

11 discussed in the ESRP, the list of factors for

12 candidate sites, that does include some non -- purely

13 non-environmental factors, does it not?

14 MR. KUGLER: Yes, that's correct.

15 MS. POOLE: Okay. So let me repeat my

16 question. Would this study be similar to one that you

17 would prepare had you done an independent separate

18 document that was a candidate site study?

19 MR. KUGLER: Probably similar, yes.

20 MS. POOLE: Okay. On a slightly different

21 note, regarding non-nuclear plants -- for example, a

22 coal-fired plant or a natural gas facility owned by

23 Dominion -- do you consider that existing nuclear

24 sites are environmentally preferable to non-nuclear

25 industrial sites?

1 In other words, does the presence -- does
2 the existing presence of nuclear-related activities on
3 a site -- how much does that bear on the environmental
4 preference of a site?
5 MR. KUGLER: I don't believe that would
6 bear at all on the environmentally preferable area.
7 MS. POOLE: Okay.
8 MR. KUGLER: Because, really, that feeds
9 more into the infrastructure and institutional areas
10 of the review. Just the fact that there is an
11 existing nuclear powerplant there would not
12 necessarily mean that it would be environmentally
13 preferable.
14 MS. POOLE: Okay. Okay. Thank you.
15 One more thought here.
16 MR. KUGLER: Okay.
17 MS. POOLE: That's all we have. Thank you
18 very much.
19 JUDGE KARLIN: All right. Any other
20 questions?
21 (No response.)
22 No. All right. I'd like to thank this
23 panel of witnesses for their patience and attention.
24 I think we have had a long day, and appreciate
25 everyone's effort.

1 Let us convene tomorrow morning at
2 9:00 a.m., same place, and I guess we'll start on
3 topic number 6 at that time.
4 So we're adjourned at this point. Thank
5 you.
6 (Whereupon, at 5:29 p.m., the proceedings
7 in the foregoing matter were adjourned,
8 to reconvene at 9:00 a.m., the following
9 day.)
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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: DOMINION NUCLEAR NORTH ANNA

Docket Number: 52-008-ESP; ASLBP 04-822-02-ESP

Location: LOUISA, VA

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

T. Walter

TOBIAS WALTER
Official Reporter
Neal R. Gross & Co., Inc.