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NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD PANEL

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HEARING

In the Matter of:	
SYSTEM ENERGY RESOURCES, INC.	Docket No. 52-009-ESP
(Early Site Permit for	
Grand Gulf ESP Site)	

VOLUME III

Third Floor Hearing Room

Two White Flint North

11555 Rockville Pike

Rockville, Maryland 20852-2738

Friday, December 1, 2006

The above-entitled matter came on for hearing, pursuant to notice, at 9:00 a.m.

BEFORE:

THE HONORABLE LAWRENCE G. McDADE, Chairman

THE HONORABLE NICHOLAS G. TRIKOUROS

THE HONORABLE RICHARD E. WARDWELL

APPEARANCES:

On Behalf of the Applicant:

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PATRICK MOULDING, Esquire; and

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I-N-D-E-X

EXHIBIT	MARKED
Staff	
Number STEX-43A	735

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

(9:07 a.m.)

CHAIRMAN McDADE: A couple of preliminary matters. First of all, have we received the electronic copy of ER-02 yet?

MR. BESSETTE: Yes, Your Honor. We provided it. We provided a full copy to Ms. Wolf yesterday on disk.

CHAIRMAN McDADE: Okay. And before we get started with the testimony concerning hearing issue I, let me just follow up. Was there any further information that you can offer with regard to the thermal efficiency of the new generation reactors?

MR. CESARE: John Cesare, the applicant, sir.

Based on publicly available information, we have concluded that if -- we understand the staff's efficiency calculation based on the surrogate design was in the area of 28 percent.

Our review concludes that we saw numbers in the 33-35 percent. And so we conclude that their number, a bit pessimistic, but we understand that they are working from the surrogate plant, is reasonable in our judgment.

CHAIRMAN McDADE: And has no impact on the

analysis here? The variance between the 33 and the 28 should not impact the analysis?

MR. CESARE: That's correct.

CHAIRMAN McDADE: Okay. Thank you.

Anyone on the staff on that point?

(No response.)

CHAIRMAN McDADE: Apparently not. Are you ready to proceed on --

MR. BESSETTE: Judge McDade, this is Paul Bessette. We have a couple of follow-up issues.

CHAIRMAN McDADE: Okay.

MR. BESSETTE: First, in response to the request from the Board yesterday with regard to how soon we could review the transcript and provide comments, we have been in contact with the court reporter system.

And it seems that they believe they have some direction from the Board that we don't need the transcript until next week and that, for some reason, they're requesting some authorization from the Board for us to get the transcript earlier. So if there's anything you could do to facilitate that? I mean, it's our experience that you should be able to get a transcript within a day or so. So we don't really understand why there are any roadblocks to that. Is

there assistance perhaps Ms. Wolf could provide on that matter?

CHAIRMAN McDADE: Okay. There is no particular roadblock. Let me just note with regard to that you can get the transcript basically any time you want. It's a function of how much you pay for it.

MR. BESSETTE: And that's our understanding, but we --

CHAIRMAN McDADE: And it's a pay-per-page. Given the rate of the transcript, the standard that we ordered is a seven-day transcript.

I'm not directing that you do it in any particular time. What I was asking is just simply for your estimate as to when you would be able to get the corrected copies to us so that we could take that into consideration in writing our opinion.

If you all want the transcript earlier in order to facilitate that review by your experts, it would just simply entail ordering it and paying the extra money to the court reporting firm.

MS. SUTTON: Yes, Your Honor, we understand that. And that's what we're attempting to do. The court reporter is pushing back and saying that they need your authorization to put additional people on this to provide it on an expedited basis,

which is quite unusual.

But we're asking, if they do contact your Board, will you please tell them that yes, indeed, they need to put additional bodies on this? We have indicated that we will cover any fees that are necessary, but we would like to receive the transcript on an expedited basis, a highly unusual circumstance, but they indicated they are going to be contacting the Board.

CHAIRMAN McDADE: That's fine. We will do whatever we can to expedite the transcript to you. And, again, once that is worked out, we don't necessarily need a firm commitment from you right now but for our planning purposes would like to know when you anticipate getting any corrected copies to us, also from the staff as well because we need a stationary target before we issue our opinion.

We don't want to base a finding of fact on the transcript and our agreeing that the transcript is correct and then have the witness come in and say, "No. Apparently I was misunderstood." So that's all. We're just looking for for planning purposes a time. And we will do whatever we can to help expedite the transcript.

MR. BESSETTE: This is Paul Bessette.

We understand that. And as soon as we get a timeline on the transcript, we can provide that information.

With regard to two follow-up requests for the updated exhibit list and the updated SERI witness list, we should be able to provide that to you by the end of the day.

And, finally, Mr. Zinke from the applicant has some follow-up comments on the staff's presentation H from yesterday. If it would be appropriate for him to do that now, we could do that before we begin presentation I.

CHAIRMAN McDADE: Well, let me just ask, how long do you anticipate the follow-up will be, Mr. Zinke?

MR. ZINKE: George Zinke, the applicant. My comment will be about 15 seconds.

CHAIRMAN McDADE: Well, I think we can squeeze that in.

MR. RUND: Before we get there, could we stay on the transcript? As I understand it, the staff relies on the same transcript that the Board gets. So if the Board requests a seven working day transcript, we may need to wait until then to start reviewing it, so depending on when the Board gets the transcript.

I spoke with Mr. Cavanaugh, who works for the Board, this morning. He had indicated seven working days. So that's a little later than when we had anticipated getting it. And we based our calculations on our witness' availability based on then. And so now that we're kind of pushing it to mid December almost when we would get the transcript and then be able to start our review.

We will work as quickly as possible, but I just want to emphasize that sooner would be better.

CHAIRMAN McDADE: Well, with regard to budgetary issues, if you feel it would be helpful for you to get the transcript quicker, just simply mention that to us. And we can see about ordering it.

As I said, the standard for us is seven days. And that's the normal contract under normal payment. In the event that there is a reason for getting it quicker, extra money can be allotted for that.

So if that's what you think you would like, just simply let us know. We will then try to make the appropriate arrangements with the court reporter to get the transcripts both to the staff and to the applicant as quickly as possible.

But, again, when we originally -- the

contract with the court reporter would be seven days unless specified otherwise. And we had not previously specified otherwise. So that was the understanding, I believe, that the court reporting firm was working under.

And it may or may not be possible for them to expedite it. It will also depend on how quickly. You know, they may not be able to get it in one day but can get it in three. So we will check that as soon as we break.

MS. SUTTON: We appreciate that, Your Honor. And we also will work with the staff assuming we can get it on an expedited basis and work to get it to them as well because we would like to see this move quickly as well.

MR. RUND: Thank you.

CHAIRMAN McDADE: And I take it you have no objection to Mr. Zinke taking up 15 seconds before we get started with your witnesses?

MR. RUND: We do not. Thank you.

CHAIRMAN McDADE: Please proceed, sir.

MR. ZINKE: With regard to yesterday's oral presentation on issue H, which was NRC staff exhibit 18 around the point in time of slides 10 and 11, Mr. Wilson suggested that the Board add appendix

J of the FEIS as a permit condition.

We would like to put on the record that we believe this is not necessary based upon the regulations and the processes that we described yesterday during issue G, SERI exhibit 32, concerning how commitments and assumptions carry forward into the COL licensing process.

CHAIRMAN McDADE: Okay. Thank you.

Are we ready to proceed?

MR. RUND: Staff is prepared to move forward with its presentation on hearing issue I. For that presentation, Steve Klamentowicz, Eva Hickey, and Van Ramsdell will participate, as will Jay Lee. And James Wilson is up there as well.

Whereupon,

STEVE KLAMENTOWICZ, EVA HICKEY, VAN RAMSDELL, and JAMES WILSON

were called as witnesses by counsel for the staff and, having been previously duly sworn, were further examined and testified further as follows:

CHAIRMAN McDADE: And I believe all of these individuals have previously been sworn. They're still under oath.

MR. RUND: Actually, I don't believe that Jay Lee has been sworn.

CHAIRMAN McDADE: Oh, okay. I'm sorry. We did have a Dr. Lee testify, but it was a different Dr. Lee who testified.

MR. RUND: I believe that's correct.

CHAIRMAN McDADE: Okay. Would you please stand, sir?

Whereupon,

JAY LEE

was called as a witness by counsel for the staff and, having been first duly sworn, was examined and testified as follows:

CHAIRMAN McDADE: Please be seated. Thank you.

And we have Dr. Lee's curriculum vitae admitted as an exhibit.

MR. RUND: Yes. It's staff exhibit 13, I believe.

CHAIRMAN McDADE: And there's no objection from the applicant as to receiving his testimony as an expert. Is that correct?

MR. BESSETTE: No objection from the applicant.

CHAIRMAN McDADE: Thank you.

Okay. You may proceed.

WITNESS WILSON: My name is James Wilson.

I am the environmental project manager for the environmental review. I'm going to briefly describe the safety and environmental reviews as well as identify the relevant regulatory criteria involved in the radiological reviews performed by the staff.

I am going to refer now to slide 1 in staff exhibit 19. The staff evaluated the radiological impacts of normal operation, of one or more new nuclear units at the Grand Gulf site, including a discussion of the estimated radiation dose to a member of the public and to the biota inhabiting the area around the new units. Estimated doses to workers at the new units were also discussed.

Radiological impacts were determined using the PPE approach for bounding direct radiation. And liquid and gaseous effluents were used in the evaluation.

The NRC reviews plant design to ensure shielding and radwaste processing systems are adequate to control doses to members of the direct, direct radiation, and radioactive effluents within the limits of 10 CFR parts 20 and 50, appendix I, and 40 CFR part 190. Releases within these limits are considered not to pose an undue risk to health and safety.

The off-site dose calculation manual,

ODCM, describes the methods for control of liquids, gaseous, and solid waste that may contain radioactive material, including radiological effluent and environmental monitoring programs.

The ODCM is reviewed by NRC, adherence to the ODCM as specified in administrative control sections of plant technical specifications.

Slide 3. Pathways for radiation exposure to the public are evaluated; including direct radiation from the sky shine and gaseous plume; inhalation; congestion; or contaminated water; vegetables; milk; meat; and fish; and recreational activities, such as swimming.

The ODCM describes the methods for estimating doses to the maximally exposed member of the public from these pathways, which must be maintained as low as is reasonably achievable, or ALARA, in accordance with 40 CFR standards, 10 CFR part 20 standards, and 10 CFR part 50, appendix I, design standards.

The NRC reviews plant design to ensure that occupational radiation exposure can be maintained within the limits of 10 CFR part 20. Part 20 further requires occupational radiation exposure to be maintained ALARA.

The NRC reviews the plant design to ensure doses to the public can be maintained within the criteria in part 100 or 10 CFR 50.34(a)(i) for design basis accidents. Those accidents assume loss of integrity of fuel cladding but have an intact containment.

The NRC also evaluates the probability and consequences of severe accidents, which assume significant core damage and containment failure to assess overall plant risk.

The differences between the safety review on the Atomic Energy Act and the environmental review under NEPA result from different regulatory objectives.

The NEPA reviews are governed by the rule of reason and employ best estimate methodology to ensure that reasonably foreseeable radiological environmental impacts of plant operation are considered in making a licensing decision.

The safety review is based on bounding analyses using adverse conditions resulting in conservative estimates to ensure that safety design criteria and radiation protection regulations are met.

With the Board's indulgence, the staff would propose to reorder the presentations on the

subparts of issue I and consider normal releases first.

CHAIRMAN McDADE: That's fine.

WITNESS WILSON: The first presentation would be provided by Eva Hickey of PNNL for the environmental review and by Steve Klamentowicz of the NRR staff for the safety review.

Following the discussion of normal release reviews, Jay Lee of the NRC staff will be discussing design basis accidents and accident sequences. Following that, Jay will provide an overview of the radiological analyses and results of discussion of the staff's safety review.

Next, Van Ramsdell of PNNL will discuss accident model results followed by a discussion of external events, core damage frequencies.

Finally, Goutam Bagchi of the NRC staff is available to discuss any further issues the Board has with regard to liquid radwaste tank failures at the COL stage, an issue that I think we have addressed before and you indicated we didn't need a presentation on this morning.

CHAIRMAN McDADE: That's fine.

WITNESS WILSON: Okay. Next I would like to introduce Eva Hickey of the Pacific Northwest

National Lab. She will be giving you a brief overview of the staff's environmental review.

WITNESS HICKEY: Go to the next slide. Good morning. My name is Eva Hickey. And I'm the Pacific Northwest National Laboratory technical expert that reviewed the areas of radiological impacts, portions of the non-radiological impacts, impacts from the uranium fuel cycle, and decommissioning for the environmental review of the Grand Gulf application for an early site permit.

This morning I am going to provide an overview of the process that the staff used in evaluating radiological impacts from normal releases from a new nuclear unit or units at the Grand Gulf site.

Next slide. During my presentation, I will discuss the following. Oh, as a reminder, this is staff's exhibit 19. During my presentation, I will discuss the following; first, the guidance used for conducting the staff's review and the regulatory criteria and the guidance that was used in forming the staff's conclusions.

Next I will describe the process that was used for conducting the evaluation of radiological impacts. I will describe in general terms how using

a PPE approach impacted my evaluation. And, finally, I will discuss the results of my evaluation. And I will summarize my conclusions.

Although we conducted an evaluation of the radiological impacts to site preparation workers, construction workers, from the currently operating Grand Gulf reactor, I am going to limit my discussion to radiological impacts from operation of the proposed units. This is because of my understanding based on the Board's order that you're interested in normal releases from the proposed units.

Next slide. This review followed the requirements in 10 CFR part 51 and the National Environmental Policy Act. Also, where applicable, we followed the guidance in RS-002. The guidance that we used for the review is found in NUREG-1555, the environmental standard review plan, or the ESRP.

The ESRPs that I based my review and that I will discuss today are 3.5, radioactive waste management system; 5.4, radiological impacts for normal operation; and 6.2, radiological monitoring.

Next slide. To put the rest of my presentation in context, I want to take a minute to discuss the radiological environment around the Grand Gulf nuclear station unit I.

A radiological environmental monitoring program, a REMP, was started prior to the operation of unit I in 1978. This pre-operational program ran until unit I became operational. And the program continues today.

The REMP includes monitoring of the airborne exposure pathway, direct exposure pathway, water exposure pathway, and the aquatic exposure pathway.

The findings from the REMP, which summarizes the release from the current unit, are found in two annual reports: the annual radiological environmental operating report and the annual radioactive effluent release report.

The staff reviewed these reports for four years to ascertain any trends from the operating plant. The staff found doses to maximally exposed individuals less than the regulatory standards, those in 10 CFR part 20; 10 CFR part 50, appendix I; and 40 CFR part 190.

For the proposed new unit at Grand Gulf, there has been no additional monitoring proposed. Based on the guidance in the ESRP, the staff determined that the current REMP is adequate to characterize the pre-operational environment of the

new nuclear unit.

Next slide. Now I will move on and discuss the impacts that the staff analyzed related to the normal radiological releases anticipated from the proposed new nuclear unit or units.

The staff analyzed the doses estimated to the public from the operation of the new nuclear plant using the parameters identified in the plant parameter envelope. The doses were based on liquid and gaseous pathways as well as direct radiation.

We reviewed the analysis conducted by SERI and is described in their environmental report. And we then performed a confirmatory analysis. The staff found that the doses were within the regulatory design objectives and dose standards.

Based on the guidance in the ESRP, the staff also reviewed the doses to the occupational workers. The staff concluded that the calculated doses would be bounded by currently operating light water reactors.

The applicant committed to compliance with 10 CFR 20.1201, which are the occupational dose limits, and to follow the as low as reasonably achievable ALARA principle. I will not provide any more details on this particular evaluation.

The staff also performed an assessment of dose to biota other than humans. Now I'll turn my discussion to dose to the public and then dose to the biota.

Next slide. Exposure pathways to humans. You may be familiar with this figure. It identifies the way that humans can be exposed to radiological materials. In our review, we looked at all the pathways that would contribute to dose from the proposed new nuclear units at Grand Gulf.

First, we reviewed the exposure pathway from liquid effluents. These pathways include eating commercially caught fish and invertebrates caught in the river and external exposure from the surface of contaminated water or from shoreline sediment for activities such as sunbathing or fishing. SERI's environmental reports stated that there was no use at the Mississippi River for drinking water within 100 miles downstream from the Grand Gulf ESP site. Therefore, dose from drinking water was not calculated in our assessment.

Next slide. SERI stated that the releases of small amounts of radioactive liquid effluents is currently permitted at the Grand Gulf nuclear station and would be expected to be permitted for the new

facility at the ESP site as long as releases comply with the requirements specified in 10 CFR part 20.

Because the SERI PPE values do not use a specific reactor design, these were not reviewed by the staff for correctness. However, we used engineering and professional judgment to determine that the PPE values are not unreasonable. With this in mind, we did not review the source term or other variables used in the SERI's analysis. I'm sorry. We did not review the source term, but we did look at other assumptions that were used in the analysis. And I'll talk more about that in a minute.

The staff accepted the applicant's source term, but we looked at --

JUDGE TRIKOUROS: Let me interrupt you for one second.

WITNESS HICKEY: Okay.

JUDGE TRIKOUROS: Because this came up a couple of times. The staff in none of these evaluations reviewed the source term because I think it's a general rule that you have not looked at the source term.

So you are accepting the applicant's source term basically without -- you haven't even looked at it from the point of view of RS-002 with

respect to it being not unreasonable?

WITNESS HICKEY: What I did -- this is Eva Hickey. What I did -- and it was not as a review so much as I looked at the various source terms from the -- I don't know if it was every plant but a number of the plants that they used in their PPE and just looked to see if there were any radionuclides that appeared to be higher because they took the highest source term from each one. And from just a general overview, I did not see anything from that.

From that, I concluded that it was not unreasonable to use their source term. That was as far as my evaluation went.

JUDGE TRIKOUROS: Okay.

WITNESS HICKEY: There are several radionuclides that are listed in the source term that are not in the current models that we use for the evaluation, but it's assumed that the dose from these radionuclides is relatively small.

The LADTAP II computer program used for this evaluation is described in NUREG/CR-4013. The liquid pathway parameters given in the NUREG/CR were used by the staff and SERI to calculate the maximally exposed individual dose from the liquid pathway.

The LADTAP II program implements the

radiological exposure models described in regulatory guide 1.109, revision 1 for radioactive releases and liquid effluents.

As stated earlier yesterday, releases were based on a composite release that bounced potential releases from two ABWRs to surrogate AP1000 units, four advanced CANDU reactor ACR-700 units. The annual average liquid release for each of these designs was compared. And the most limiting isotopic releases were identified. And those became the composite release.

Other parameters that were reviewed include effluent discharge rate, amount of commercial fish catch, invertebrate harvest, and usage consumption rates.

JUDGE WARDWELL: Just so I understand this, the liquid release is limited to the effluent release from the --

WITNESS HICKEY: This is Eva Hickey. That's correct.

JUDGE WARDWELL: -- PPE plant, --

WITNESS HICKEY: That's correct.

JUDGE WARDWELL: -- the ESP plant, and that the only pathway from there would be through subsequent aquatic exposure, you didn't have any

drinking water because of the lack of using the Mississippi River drinking water.

MEMBER HICKEY: This is Eva Hickey.

Yes, that is correct except there is some dose calculated as if someone was on the river, recreational.

JUDGE WARDWELL: And is that just incidental absorption and gaseous --

MEMBER HICKEY: Yes.

JUDGE WARDWELL: -- release from the river itself from any --

MEMBER HICKEY: This is Eva Hickey.

Yes. It would be direct radiation from the sediments.

JUDGE WARDWELL: Okay. And that any potential consumption of groundwater was not considered because that would be an accidental release and not a normal release or are there other reasons why that was not evaluated?

MEMBER HICKEY: This is Eva Hickey.

JUDGE WARDWELL: Inadvertent release.

MEMBER HICKEY: Right.

JUDGE WARDWELL: I don't ask the right word. Sometimes I don't use the right NRC word.

MEMBER HICKEY: Yes.

JUDGE WARDWELL: But inadvertent release.

MEMBER HICKEY: Yes, that's correct.

Okay. I think we can go to the next slide. This table shows the calculated maximally exposed individual at the Grand Gulf early site permit site from the operation of one nuclear unit, new nuclear unit.

The calculated maximum annual dose to the total body of an adult was 2.2 millirem per year for one unit. And the calculated maximum annual dose to the bone of a child was 4.1 millirem per year.

Next slide. I will now move on to doses from gaseous effluents. For the gaseous release pathway, SERI and the staff calculated annual radiation exposures for the population within a 50-mile radius of the site for the hypothetical individuals at various ages using the GASPAR II code and assuming the following pathways: direct radiation from immersion in the gaseous effluent cloud from particulates deposited on the ground, inhalation of gases and particulates, ingestion of milk contaminated through the gas cow milk pathway, ingestion of vegetables contaminated by particulates, ingestion of meat from animals grazing on contaminated pasture.

Maximally exposed individual doses were

calculated at the following locations: the nearest site boundary, the nearest vegetable garden, the nearest resident, the nearest milk cow, and the nearest meat cow.

As discussed for the liquid pathway, the SERI PPE values do not use a specific reactor design. And they were not reviewed by the staff for correctness.

The staff accepted the applicant's source term, but we looked at the appropriateness of the other values, the other parameters that were used in the GASPAR II program. Those would include meat, milk, and vegetable production rates, meteorological data, population data, and consumption factors.

Three types of doses were calculated by the staff and compared with SERI's calculations, doses to an individual located at the exclusion area boundary of .58 miles north of the site as a result of gamma air dose, beta air dose, total body dose, and skin dose, doses to the hypothetical individual, a maximally exposed individual of various ages that are exposed to gaseous radioactive effluents by the pathways that I've discussed, and doses of the population residing within a 50-mile radius of the site.

The table on this slide shows calculated maximum doses from the gaseous pathway, doses from maximally exposed individual. This is a table that's been abstracted from the FEIS. The table in the FEIS has more data. These were the maximum values in that table.

CHAIRMAN McDADE: Do you recall the table number?

WITNESS HICKEY: It is Table 5-6.

CHAIRMAN McDADE: Thank you. The reason I ask is because in the hard copy that was submitted as an exhibit, the table didn't copy.

MEMBER HICKEY: Oh, okay.

CHAIRMAN McDADE: So it is apparent in the electronic copy but not in the hard copy that is part of the record.

MEMBER HICKEY: Okay.

CHAIRMAN McDADE: So we do note now that it is table 5-6 from the FEIS so that it will be clear we can find it. Thank you.

MEMBER HICKEY: Next slide, please. From the evaluation of normal releases from the proposed units, the liquid effluents were found to be well within the 10 CFR appendix I design objectives.

Doses at the site boundary from gaseous

effluents were also within the design objectives. Doses from liquid and gaseous effluents to the maximally exposed individual at the site boundary from the existing Grand Gulf nuclear station unit and the proposed new nuclear unit combined were within regulatory standards of 40 CFR part 190.

Next slide. We also analyzed the population dose. The collective whole body dose within 50 miles of the Grand Gulf proposed unit is estimated to be 3.2 person-rem per year. For comparative purposes, if you look at the collective dose from natural background radiation to that same population within 50 miles of the ESP site, that number is 102,000 person-rem per year.

Next I'll turn to our evaluation of exposure pathways to biota other than humans. The staff reviewed the estimates to biota that were made to the surrogate species: fish, invertebrate, algae, muskrat, raccoon, heron, and duck.

The species that were considered important for the Grand Gulf ESP site and the corresponding surrogate species are the bald eagle, wood stork, the pallid sturgeon, and the fat pocket mussel. The liquid pathways that we reviewed were for the fish and invertebrate, algae, muskrat, and duck, raccoon, and

heron. For the gaseous pathway, doses were calculated using a maximally exposed individual from the gaseous effluent pathways that I discussed earlier.

Next slide. Again, the staff used the LADTAP and GASPAR models to estimate doses to the surrogate species. We reviewed the parameters used by SERI and found them appropriate. We did have one parameter where we had some additional questions. And we requested an RAI. But we finally understood what their value was. And we assumed that and used it in our analysis also. We ran the models and compared the results to SERI's results. And they were comparable.

Next. This table compares the estimated whole body doses to the biota from the liquid and gaseous effluent pathways calculated from one proposed unit at the Grand Gulf site compared to the regulatory standards for humans in 40 CFR part 190. The biota doses for all surrogate species exceed the regulatory standards for humans.

However, we also looked. And this table compares the doses to the International Atomic Energy Agency and the National Council on Radiation Protection Measurements.

NCRP states that a chronic dose rate of no greater than one rad per day to the maximally exposed

individual in a population of aquatic organisms would ensure protection of that population.

Likewise, IAEA states that chronic dose rates of .1 rad per day or less does not appear to cause observable changes in terrestrial animal populations. The cumulative effects of current operating units and the proposed units would result in doses significantly less than the NCRP and the IAEA recommendations.

Next slide. So, finally, in summary, we evaluated the exposures to public and to workers. We estimated doses to the public and determined that they were well within the regulatory design objectives and standards.

We determined that there would be no observable health impacts to the public and that occupational dose estimates would most likely be lower than that for current reactors. Impacts to biota were evaluated and were found to be acceptable.

Finally, in conclusion, the --

CHAIRMAN McDADE: When you say "found to be acceptable," based on those international standards that you referred to?

WITNESS HICKEY: That's correct. In conclusion, the staff concluded that radiological

impacts from construction and operation would be small.

JUDGE TRIKOUROS: Are you done or --

WITNESS HICKEY: Yes, I am.

JUDGE TRIKOUROS: In this particular evaluation, there were specific plants evaluated: two ABWRs. You mentioned a number of ACR-700s, et cetera, to come up with your megawatt-electric target, I guess, as opposed to some generic source term.

I am curious as to -- and the applicant may be able to answer this question. I am curious as to what the logic is to sometimes use a bounding generic type of source term, as opposed to other instances using specific named plants and numbers of plants.

Is there some logic here or is it just arbitrary or would it be overly conservative to come up with a bounding liquid release, gaseous release, normal release source term?

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

As previously discussed yesterday about how the maximum source term was derived, the applicant used the mix, the composite mix, of the maximum curies to be released for each radionuclide. And the

maximums were taken from the various proposed designs.

So I am not quite following. They really did take an ultra-conservative maximum amount of radioactive material that could be discharged. So that the composite does in the staff's opinion represent a maximum.

The applicant ultimately if they choose a particular design with the source term will be evaluated at the COL stage. And the staff expects that the source term will be less than what has been evaluated now because it will represent a particular plant design and have the actual estimated radionuclide source term, rather than now we're looking at the maximum from all of the designs. So the staff believes this is extremely conservative.

JUDGE TRIKOUROS: But it is not correct that the specific analyses were done for specific plants? There were tables in the FEIS. And it was just discussed a few minutes ago that analyses were done looking at two ABWRs, for example, et cetera. So these were plant-specific.

WITNESS KLAMENTOWICZ: No, Your Honor. This is Steve Klamentowicz with the staff.

That source term was the source term provided by the licensee. And, as we described in the

PPE parameters yesterday, it was a composite of all of those designs. The presentation was meant -- what is implied is that the source term factored in all of those designs that the applicant is considering, but it was not a source term specific to any one of those designs. It was a blend.

At this point, I would ask if the applicant could possibly explain their composite source term if that's appropriate.

JUDGE TRIKOUROS: If it were composite, then why would you go out of your way to specify specific plants and plant combinations; whereas, in other instances, I don't think that was done?

MR. MORRIS: This is Marvin Morris for the applicant.

For the normal source terms, what was done was to take a composite, which essentially if you can imagine it would be equivalent to putting all of those plants on the Grand Gulf site at the same time and taking the limiting release from each on an isotopic basis from each of this combination of all plants.

For design basis, those were done for specific plants. So for the accident side of it, those are done for specific plants because that's the information we had to characterize those accident

source terms.

So the accident part was not done as a composite, but the normal releases were done as a composite fictional plant that considered the worst activity on an isotopic basis from the combination of all the different plant types.

WITNESS HICKEY: This is Eva Hickey. Can I make one more statement? And then maybe I think it might clarify.

JUDGE TRIKOUROS: Yes.

WITNESS HICKEY: When I listed the reactors, what that meant was in their source term, they looked at the source term from, I believe it was, like two ABWRs. So they would have looked at that source term from two of those reactors. And they would have lined that up with two of the AP1000s. I'm not sure if I remember the numbers correctly now and then taking the most limiting number from each radionuclide. I think maybe I --

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz with the staff.

To put it another way, the applicant could have chosen to have done these routine effluent dose calculations for each specific reactor design. So we would have had tables. We would have had dose

estimates for each reactor design. So we would have had multiple tables for each reactor design going through the part 20, appendix I, and 40 CFR 190.

What the applicant chose to do was basically do the composite source term based on the maximum from all of those designs combined, which is acceptable to the staff. You can either have ten tables or one or two as provided. The staff finds either way acceptable.

CHAIRMAN McDADE: And here, as I understand it, the staff finds it acceptable because it's using the highest number for each isotope. So, therefore, regardless of whatever design they ultimately used, for no particular isotope could the number exceed that which was used in this analysis. Is that correct?

WITNESS KLAMENTOWICZ: Steve Klamentowicz for the staff.

That's correct. They used the maximum terms. And when an actual design comes in, the staff expects that there will be some of the maximum numbers as provided. But there will also be values that are less. And that was evaluated at the ESP stage.

CHAIRMAN McDADE: So your analysis, then, would be based on a hypothetical maximum exposure that

could not be exceeded?

WITNESS KLAMENTOWICZ: That's correct.

CHAIRMAN McDADE: Okay.

WITNESS KLAMENTOWICZ: And that's the basis of regulatory guide 1.109 and all of the other calculations to come up with a maximum hypothetical individual.

CHAIRMAN McDADE: Thank you.

JUDGE TRIKOUROS: No, nothing further.

CHAIRMAN McDADE: Please continue.

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz with the staff.

I would like to discuss what was done for the safety analysis. The staff used the radiological dose calculations that are contained in the environmental impact statement as its basis for the safety evaluation. And the basis for doing that is that we used the same radiological standards, limits, and guidance, 10 CFR part 20, 40 CFR part 190, and appendix I, part 50.

So the safety evaluation took the dose criteria and used that in the performance of its safety evaluation and made the conclusion that with respect to normal operations, the proposed site is acceptable for constructing a plant falling within the

applicant's PPE and that the site meets the relevant 10 CFR part 52 early site permits, the standard design certifications, and combined licenses for nuclear power plants, and 10 CFR part 100, reactor site criteria as it relates to normal effluents.

That concludes my presentation. We are now ready for questions.

JUDGE TRIKOUROS: I have no questions for you.

WITNESS KLAMENTOWICZ: I will now --

JUDGE WARDWELL: Yes. I think I will save all my questions on I until the end because I'm not exactly sure who it is best for. I can find that out.

WITNESS WILSON: If you give us a moment, we will reassemble our panel for the next go-round of presentations.

(Pause.)

CHAIRMAN McDADE: If you could hold on for a moment? The applicant appears to be caucusing. Let them get ready as well. They probably want to hear what you have to say as much as we do.

MR. BESSETTE: We are ready, Your Honor.

CHAIRMAN McDADE: Okay. Thank you.

Dr. Lee?

WITNESS LEE: Good morning. My name is

Jay Lee. I am a senior health physicist in NRC Office of Nuclear Reactor Regulation.

I review applicant's site safety analysis report, SSAR, section 3.3, titled "Postulated Accidents and Accident Dose Consequences." And then I prepared staff's draft and final safety evaluation report, section 15, titled same title, "Postulated Accidents and Accident Dose Consequences."

This morning I will be presenting the first two items, item 1 and item 2, requested by the Board in hearing issue I. The first item has to do with the selection of a design basis accident and the event name that appears in the SSAR, FSER, and FEIS.

The staff used design basis accidents names that are listed and analyzed in regulatory guide 1.183. Now, this document provides guidance to the applicant and the licensees for the selecting the minimum number or minimum the number of design basis accidents they must analyze. And that particular document was issued in July 2000.

And then the second document I used was standard review plan, SRP, 15.0.1. Now, this document provides guidance to the staff which design basis accident we are supposed to analyze.

And the third document I used was

NUREG-0800. This is all SRP issued back in 1981, right after TMI accident. And this is a rather old document, but we are still using it.

Now, after we issued this NUREG-0800, the staff had changed its position several times which design basis accident we should look into and which design basis we should analyze for. The regulatory guide 1.183 and the standard review plan 15.01 shows that the current staff technical position on the selection of design basis accident.

I might add also that the design basis accident selected in regulatory guide 1.183 and SRP 15.01 is a minimum design basis accident applicant is supposed to analyze, but they could add the more design basis accidents if they see fit.

And the last doc and also the NUREG-0800 list all reactor transients, not only DBAs but anticipated operational currents, frequent event, or infrequent event, or even the reactor transient beyond design basis accident. So it includes all rector transients.

The last document I used was 1555, NUREG-1555. This document was prepared by an NRC contractor. And it is for standard review plan for providing the guidance to the staff for reviewing

environmental review, if you choose, for the environmental recall that is submitted by applicant.

The staff constructed a table to show which design basis accident the applicant selected and used and what staff member in the final safety evaluation report and final environmental impact statement we used.

The first column shows the design basis accident selected by the applicant. Now, these lists are consistent with the guidance provided in the regulatory guide 1.183 for the selection of design basis accident.

In fact, applicant added one more design basis accident in addition to what we delineated in the regulatory guide 1.183. This additional DBA added is a small line break outside containment. We do not have that design basis accident. We no longer have this design basis accident listed in regulatory guide 1.183.

We drafted this about eight or nine, ten years ago from our list because this particular event is really not associated with the reactor fuel integrity, meaning that it is challenging to the reactor fuel, the failure or including the reactor fuel melt.

And also this event is not associated with accident source term at all. Rather, this is associated with normal primary coolant concentration in the reactor coolant, nothing to do with the accident source term. And it could possibly include iodine spike, for example. Other than that, it's not really related to the reactor transient per se.

Now, this small line is typically like one-inch sample lines or half-inch insulin line or two-inch CBCS letdown line. That's the chemical and volume control system line, two-inch line break.

In the case of PWR, that could mean reactor water cleanup system line break, which is two inches or two and a half inches. So those are the small lines we are talking about.

In addition to that, the staff analyzed this particular event so many times, up to 30-40 times. Without exception, we always find the radiological consequences resulting from this particular event is insignificant. And it's certainly bounded by LOCA. Therefore, we dropped this particular event.

But I believe they added after this event because ABWR and AP1000, they analyzed it first. So, therefore, they added, I think, in their list, which

is okay.

So this column, even though there's a slightly different title in, really, cosmetic nature, like, for example, in the second line item, it's reactor coolant pump lot water, we call that in the regulatory guide 1.183 as PWR lot water accident. So there's a slight inconsistency in the title of event, but I think this is really in the nature of a cosmetic nature that, really, we know what that accident meant.

And also the applicant called a control rod ejection accident for PWR, but in regulatory guide 1.183, we call it the PWR rod ejection accident. So they are really the same accident.

And also the applicant called "control rod drop (PWR)," but in the regulatory guide 1.183, we call PWR rod drop accident. So there's a slight difference in the nomenclature or title of design basis accident, but they are really the same.

Then we have --

CHAIRMAN McDADE: Let me just interject something here --

WITNESS LEE: Yes, sure.

CHAIRMAN McDADE: -- for clarification in the event this is ever reviewed by another tribunal, that the design basis accident, basically you're

thinking of things that can go wrong. And you're determining what would happen if, in fact, it went wrong.

WITNESS LEE: Right, challenging the reactor fuel integrity and subsequently releasing efficient product to the environment.

CHAIRMAN McDADE: And given the fact that a particular reactor design has not yet been chosen here, you're doing that in this analysis for different types of reactors. For example, when you refer to a "BWR," you're talking about a boiling water reactor, correct?

WITNESS LEE: Yes.

CHAIRMAN McDADE: So what you're doing here is just looking at what could go wrong with different kinds of reactors and then the impact of that and how it would be handled. Is that correct?

WITNESS LEE: Yes. That's the purpose for regulatory guide 1.183. However, the applicant for this Grand Gulf case, they're referring to specifically certified ABWR and the proposed AP1000.

CHAIRMAN McDADE: Okay. Thank you.

JUDGE TRIKOUROS: I can save us some time. I had originally asked those questions regarding nomenclature and that sort of thing. I'm fully

satisfied at this point that I understand the differences between all the nomenclature. And I am fully satisfied that the numbers of events evaluated between the documents are consistent.

So if that helps you, we could move on quicker.

WITNESS LEE: Okay. That's really all about this table. If you have no question, I'll go to the next item. Let me just explain that I have three notes in that table.

Note 1 is really both questions, number 81, 82, for example, why is the reactor coolant pump shaft break excluded from staff's review. That was your question.

And the response, which we gave you, is this is really listed as reactor coolant pump lot water accident, that same accident. Okay?

JUDGE TRIKOUROS: They're a different accident, same result.

WITNESS LEE: Well, initiating event is different, but the sequence of event and the resulting radiological consequence is the same.

JUDGE TRIKOUROS: Right.

WITNESS LEE: In fact, it's identical.

Okay. Then I'm going to move if you have

no questions. Item 2. Is that okay?

JUDGE TRIKOUROS: Yes. That's good.

WITNESS LEE: Item 2 is an overview of the radiological analysis. This is rather a really quick overview of the radiological analysis. At least it shows what the applicant did and what the staff did.

The applicant did not select a particular reactor design. Of course, we know all of this. We have talked about this the last two days. And also applicant used surrogate reactor designs. We all know that. We discussed that last two days.

And applicant did not perform a new radiological consequence analysis. What they did was directly extracted radiological consequence analysis from the design certification document previously submitted to and reviewed by the NRC in connection with the design certification application. In addition, they just provided only one DBA. In this case, it's a LOCA for the advanced CANDU reactor, ACR700. Then staff quickly found out this is indeed bounded by AP1000 LOCA.

What the staff did, staff performed independent confirmatory review at the time of design certifications. In the case of ABWR, we did in 1994 and AP1000 in 2004. We did perform an independent

confirmatory review.

However, for this, the Grand Gulf early site permit, we did not need to perform further confirmatory radiological consequence analysis in review of Grand Gulf ESP application, as a site, as stated in that final safety evaluation section 15.3.4.

JUDGE TRIKOUROS: So in this particular case, since the DCD was used, it was as specific source term for a specific reactor?

WITNESS LEE: Correct. We have a source term for the ABWR. We have a source term for the AP1000.

JUDGE TRIKOUROS: And how does that impact the permit? I mean, will the permit say that if you build a plant other than an ABWR or an AP1000, that you have to reevaluate the design basis accidents or how does that work?

MR. WEISMAN: Your Honor, this is Bob Weisman for the NRC staff. I had planned on addressing that when I went through the permit, my discussion that I was planning on doing later at the end of the hearing. But I can address that now if you'd like.

JUDGE TRIKOUROS: No. That's fine. If you're going to do it later, we can put it off until

then.

But I just wanted to make clear this was one example where there was not a bounding evaluation done.

MR. WEISMAN: Right.

JUDGE TRIKOUROS: It was specific.

WITNESS LEE: Yes. This is Jay Lee again.

No. We don't have bounding source term like a normal effluent release. This is we have separate source terms for ABWR and AP1000. In fact, each design basis accident has its own source term as PPE values. So the source term PPE values are the efficient product release timing as well as release rate as well as competition of efficient product nuclides as well as design basis accident.

JUDGE WARDWELL: And then could you say that again or -- I guess I don't want you to say it again. I heard it, but could you say it another way?

Well, let me say what I think I heard you say. And you correct me if I'm wrong.

WITNESS LEE: Yes.

JUDGE WARDWELL: This analysis has been performed for both the ABWR and an AP1000, correct?

WITNESS LEE: Applicant used it, yes.

JUDGE WARDWELL: I'm sorry. Yes. Assume

I said -- I misspake, yes -- the applicant.

WITNESS LEE: Yes.

JUDGE WARDWELL: In your review, you have discovered that, in fact, they have performed this analysis for an ABWR. And then they repeated the analysis for an AP1000.

WITNESS LEE: Correct.

JUDGE WARDWELL: And then your last statement in regards to the sequencing and timing of that, you said that the source term actually varies by the selected design basis accident. You were just saying that the source term from an ABWR as applied to a design basis accident will change for each one depending upon the timing and the sequencing and the release of the radionuclides. Is that correct?

WITNESS LEE: Right. Accident source term release is a function of time. And it also varies depending on the type of design basis accident.

JUDGE WARDWELL: But it's still based on the ABWR performance --

WITNESS LEE: Yes.

JUDGE WARDWELL: -- under those design basis accidents?

WITNESS LEE: Right, correct.

JUDGE WARDWELL: And then they repeated

that same thing for the AP1000 for the different design basis accidents taken to different source terms for each one based on its performance?

WITNESS LEE: Yes, sir. We have verified that, that source team.

JUDGE TRIKOUROS: Let me make sure the record is clear. They did not perform these analyses. They used the analyses that were already performed in the DCDs for these plants, correct?

WITNESS LEE: Correct.

JUDGE TRIKOUROS: Okay. So you did not review, the applicant did not do any DBA analyses? You did not review the DBA analyses because you had already reviewed the DBA analyses that were performed as part of the DCD. Is that the correct statement?

WITNESS LEE: Yes, Your Honor.

JUDGE WARDWELL: And that's the basis from which the ESP will be approved. And we'll hear on how that is achieved and what it means if, in fact, at COL stage that a different plan is implemented or proposed.

JUDGE TRIKOUROS: Right.

JUDGE WARDWELL: Thank you.

WITNESS LEE: Okay. Then, lastly, of course, staff verified applicant's calculation using

the case 1, case 2 equations that follow the next slide.

Then, as I stated, we had verified the source terms and doses and all the methodology appearing in these, indeed same as what the applicant stated that they used.

Okay. Next slide. This is really nothing to do with the Grand Gulf early site permit. I'm just trying to show how we did it in the standard reactor certification review. This is just basic equations simplified, the basic equation for how we do the dose calculation just showing this in the design certification.

Radiation dose in terms of rem is equal to the source term expressed in the curie times atmospheric dispersion factor. Now, atmospheric dispersion factor is commonly referred as Chi/Q, Chi being Greek alphabetic Chi, or it could spell out as a Chi/Q. Chi is efficient product concentration in terms of curie per unit volume, in this case cubic meter, Q being release rate of efficient product, curies per unit, in this case per second.

So the curies cancel out. And it has a unique unit for the atmospheric dispersion factor as a second per cubic meter. Now, this atmospheric

dispersion factor, is really postulated Chi/Q values because standard reactor design, they don't have a site. So this is a postulated Chi/Q I call it. Some of my peer reviewers call it hypothetical Chi/Q values or some people even call reference Chi/Q.

The way the vendor, in this case General Electric and the Westinghouse, how they get the postulated atmospheric dispersion factor, they do it one of two ways. One way is they back-calculate using this equation because they know what the radiation dose limit is, in this case 25 rem, total effective dose equivalent Teddy, 25 rem Teddy. They know the source term. So they back-calculate the maximum Chi/Q values they can have. That's one way.

The other way is they listed all current operating reactor site Chi/Q values in descending order of Chi/Q values. Then they arbitrarily cut like 80 percent or 85 percent, 90 percent. They're saying, "Yes. Eighty percent of current operating site will accommodate, should be able to accommodate this ABWR design, for example." So that's rather arbitrary.

In fact, General Electric, who is the vendor for the ABWR, they did it both ways. They came out with the postulated Chi/Q values. And then we multiplied that with the breathing rates.

Now, breathing rate also varies as a function over time, zero to 8 hours and 8 to 24 hours and after 24 hours. And these breathing rates, these breathing rates for standard man is in the International Commission on Radiation Protection publication 2 issued in 1959. We used that number for the calculation.

Then dose conversion factor in the rem per curie, we use federal guidance code 11.

JUDGE WARDWELL: You're mixing up vendors and "we."

WITNESS LEE: Pardon?

JUDGE WARDWELL: You just said that "We used."

WITNESS LEE: Staff used.

JUDGE WARDWELL: Who is doing this calculation? Is this something that --

WITNESS LEE: Well, this page --

JUDGE WARDWELL: --the applicant or the staff is doing or is this something that is part of the CDC?

WITNESS LEE: We all used. The Grand Gulf used this. And reactor vendors in the DCD used and staff used for confirmatory analysis. We used this equation.

JUDGE WARDWELL: The applicant and the staff used this equation to calculate out the radiation dose?

WITNESS LEE: Yes.

JUDGE WARDWELL: Did you not use the Chi/Q values that are in the site characteristics, as opposed to any postulated Chi/Q values?

WITNESS LEE: Okay. That comes in the next slide.

JUDGE WARDWELL: See, I just couldn't wait.

(Laughter.)

JUDGE WARDWELL: I'll wait. I'm so excited.

WITNESS LEE: For the Grand Gulf site, they didn't use site-specific Chi/Q values. They postulated Chi/Q values. They used them both. They took a ratio of it. And I'll come to it in the next slide.

JUDGE WARDWELL: I'm sorry? I missed who they are.

WITNESS LEE: They are the applicant.

JUDGE WARDWELL: Okay. I didn't hear that. I didn't know who you were referring to. Thank you.

WITNESS LEE: Okay. This, the federal guidance report 11, is issued in 1988 by U.S. EPA and Oak Ridge National Laboratories. And this dose conversion factor is widely used in the nuclear industry, including NRC and reactor vendors and applicants and the licensees.

Okay. Next slide shows how did the Grand Gulf calculate site radiation dose. There radiation dose at the ESP site is equal to the source term dc. This source term dc, this value is the same as previous slide. Can I go back to the earlier slide? Oh, okay. Same as this source term over here.

So this is a source term at dc using the same source term. And then here they use site-specific atmospheric dispersion factors. This is site characteristic value. And then they use the same briefing rate and the same dose conversion factors.

Next slide. Then what the applicant did is they substituted equation 1 into equation 2 for the source term in the certified design. If you substitute, this is sort of a long equation, but I couldn't do it better in PowerPoint slide.

But, actually, the radiation dose, FDSP site, is equal to radiation dose in the design certification and then multiply that. And the Chi/Q

values at the site briefing rate and times conversion factor devalued by -- this is division -- divided by Chi/Q values and briefing rate and dose conversion factors.

So substituting this, then this dose conversion factor cancels out and the briefing rate cancels out. It comes out to -- next slide. Believe me, this is what it is going to add up to if you substitute equation 1 into equation 2.

The radiation dose as the ESP site is equal to radiation dose in the design certification times Chi/Q values at the ESP divided by Chi/Q values in the dc. So this term is going to be a simple ratio of Chi/Q values.

So what they did was they just used the ratio of Chi/Q values. So, in other words, in the future COL applicant or ESP holders, they will come in and they will show that their site-specific Chi/Q value is less than postulated Chi/Q values in the dc they are referencing.

Then the staff most likely will conclude that the radiation dose ESP will meet the radiation limit.

JUDGE WARDWELL: Or is that vice versa? The smaller the Chi/Q value, the --

WITNESS LEE: Over dc.

JUDGE WARDWELL: But the smaller it is, the farther the dispersion, isn't it?

WITNESS LEE: Right. So going back to that equation --

JUDGE WARDWELL: Would you say that average? Go ahead.

WITNESS LEE: No.

JUDGE WARDWELL: At the COL stage, when you're comparing Chi/Q values or this ratio, -- I don't care which --

WITNESS LEE: Yes.

JUDGE WARDWELL: If you add it, it will be directly related. If, in fact, this ratio ends up smaller than what was done at the ESP stage, that is more critical, isn't it?

WITNESS LEE: No. It's the other way around. It's better. I can show that in an equation again. Can I have that slide back?

JUDGE WARDWELL: I don't need to see it if that's what it is.

WITNESS LEE: So this is the ratio we are talking about. If Chi/Q values at the site are smaller than postulated Chi/Q values in the dc, this particular term will become less than one. The less

than one times the radiation dose, which we already accepted in the design certification, then radiation dose at the site will be less. Am I making clear to you?

JUDGE WARDWELL: Yes.

WITNESS LEE: Okay. Okay. Then case 2, what the applicant did was they had a different approach for ABWR because ABWR was certified for certain design basis accidents. They did not analyze for low population zone. We have to analyze for the exclusion area boundary as well as low population zone for each design basis accident.

What the G.E. did about 14 years ago or so, they did a similar design basis accident, like, for example, fuel-handling accident, which duration of that particular event is two hours, much less than 30 days for LOCA.

What the G.E. did was they did not calculate the dose for the low population zone. They just did it exclusion area boundary for the first two hours. That's the way ABWR was certified.

Then applicant rightly decided that they needed to calculate the doses for EAB, exclusion area boundary, as well as low population zone. So, therefore, they couldn't find the radiation dose at

the dc, this number for the ABWR certain design basis accident.

So they had to go back, get the radiation source term, this from design certification, to come up with radiation dose. So that's why they used the case 1 and case 2.

Now, case 1 equation, the applicant used for all AP1000 plus LOCA for ABWR. They used a case 2 for the ABWR other than LOCA because they couldn't find the dose number at the low population zone? Maybe applicant will confirm whether that was the correct.

MR. MORRIS: This is Marvin Morris for the applicant.

Yes, that is correct.

WITNESS LEE: Okay. And if you don't have any question, I am coming to the conclusion.

CHAIRMAN McDADE: Well --

WITNESS LEE: Yes?

CHAIRMAN McDADE: One thing I would like clarified -- and I think that you said, and I just wanted to make sure I understood it correctly, about ten minutes ago -- that the methodology used by the vendor in calculating the postulated Chi value was somewhat arbitrary.

WITNESS LEE: Yes.

CHAIRMAN McDADE: Is that correct?

WITNESS LEE: Yes.

CHAIRMAN McDADE: Okay. Now, when I hear the word "arbitrary," I kind of wonder why if it's arbitrary it's acceptable. So would you sort of explain that for me? If the methodology were somewhat arbitrary, why in your professional opinion was the methodology acceptable?

WITNESS LEE: Maybe "arbitrary" was perhaps not right word, but they just came out with in their opinion what would be the appropriate value for the Chi/Q values and so that the COL applicant can build the ABL design at their site.

So you are correct. That is not really arbitrary in terms of picking the number from air. No, that is not the case. As I mentioned, they did it one of two ways. They back-calculated or they listed all actual existing Chi/Q values for all operating reactor sites. So they did have actual data.

So perhaps my word "arbitrary" is not appropriate. I will take that word back.

CHAIRMAN McDADE: And you find that analysis acceptable?

WITNESS LEE: We have already accepted in

the design certification review, and Commission approved.

CHAIRMAN McDADE: Okay.

JUDGE WARDWELL: But, in fact, it could be arbitrary if you look at your slide 35 because as they would have changed or selected a different Chi/Q factor, their calculated radiation dose would change equivalently --

WITNESS LEE: That's right.

JUDGE WARDWELL: -- in a linear fashion? And so whatever they happened to select is reflected in the radiation dose. And you would still end up with the same calculation here once someone plugged in the actual site characteristics, Chi/Q value.

WITNESS LEE: You're correct.

JUDGE WARDWELL: So it all comes out in the wash. So, in fact, it could be arbitrary. You're saying it isn't, but fine. It could have been, too.

WITNESS LEE: But they accepted. Your Honor, they did explain why they picked that number.

JUDGE WARDWELL: Sure.

WITNESS LEE: And the staff accepted.

CHAIRMAN McDADE: Okay. So, just to make sure that the record I think is going to be clear, it started out in the design basis the Nuclear Regulatory

Commission accepted the analysis of the vendor, the manufacturer of this particular reactor design.

WITNESS LEE: The way they came out with the postulated Chi/Q values. Yes, we did. Staff did.

JUDGE WARDWELL: Right. Based on that, the applicant used that value in doing its calculations. And then you accepted that value and confirmed that value in your review of the applicant's submission, correct?

WITNESS LEE: Yes, we did. I have to qualify --

JUDGE WARDWELL: And you found that analysis to be acceptable, --

WITNESS LEE: Yes.

JUDGE WARDWELL: -- that it was logical and it was consistent with how it should have been done based on your professional knowledge and experience?

WITNESS LEE: Yes. But I would like to qualify my response to that question. The applicant did not use the postulated Chi/Q values in final AP1000 certified design. They used preliminary Chi/Q values. That number is also a reasonable number for the ESP site suitability review.

JUDGE WARDWELL: So the variance between

the preliminary and the final is not so significant as it would change your calculation?

WITNESS LEE: It is significant in a way. For example, if applicant decided to build AP1000 at the Grand Gulf exactly the way we certified, they cannot build AP1000 at the site the way we certified because the postulated Chi/Q value they used is different from the final certified AP1000 values.

JUDGE WARDWELL: So how is this captured in the ESP?

WITNESS LEE: I'm sorry?

JUDGE WARDWELL: How is this variance captured in the ESP?

MR. WEISMAN: Your Honor? Your Honor, this is Bob Weisman, NRC staff.

CHAIRMAN McDADE: Yes?

MR. WEISMAN: And that is something that I can address when I do my presentation on the content and form of ESP.

CHAIRMAN McDADE: Okay. Thank you. I think the way it was described is that basically it's going to be a legal discussion of that, rather than requiring any additional expert testimony on it.

MR. WEISMAN: Your Honor?

CHAIRMAN McDADE: So I think we can move

on to the next step unless Mr. Cesare --

JUDGE WARDWELL: Yes. I think I would like to hear from the applicant on this.

MR. CESARE: John Cesare with the applicant.

The AP1000 can be sited at Grand Gulf. The methodology that the staff has described is exactly what we would do in the COL application. The AP1000 now has been certified. It has a reviewed source term, dose calculation, and postulated -- I'll use the terms from SERI exhibit 19 yesterday -- site parameter.

A site parameter postulated assumed number, arbitrary or otherwise, it was determined Chi/Q that the vendor could, therefore, propose that their reactor could be sited at a wide family of sites in the United States.

We would take that site parameter postulated in the design control document. And we would compare that with our ESP, established site characteristic. And it would be that ratio against the certified dose consequences.

We would show that we met accident analysis dose requirements. And that would permit us to show that the AP1000 could be selected and sited at

the Grand Gulf site.

CHAIRMAN McDADE: Okay. Thank you.

JUDGE WARDWELL: And do you agree with that explanation that the applicant just gave as copacetic with your review/understanding?

WITNESS LEE: Yes. I agree with the qualification that we may have to reanalyze radiological consequences for using right Chi/Q values in a certified document.

JUDGE WARDWELL: But if the Chi/Q values that are presently listed in the site characteristic table hold to be true once the plant is proposed for that site at the COL stage, shouldn't it be acceptable based on what I just heard from the applicant?

WITNESS LEE: Postulated Chi/Q values are not in the permit or they're not the site characteristics. Only actual site Chi/Q values are site characteristics.

JUDGE WARDWELL: Right. But the postulated one was only used, if I understand it correctly, by the vendor in their development of their dc radiation dose.

WITNESS LEE: Yes. Then applicant used, of course, that for the ratioing with their actual site Chi/Q values.

JUDGE WARDWELL: You're still losing me, though, why an AP1000 couldn't be sited based on ESP documentation in this particular area, radiation dose criteria, if, in fact, the site characteristic Chi/Q value that is presently in appendix A of the SER is still the correct one for the site once it is proposed at the COL stage.

WITNESS LEE: Because the ratio I just pointed out in my slide, the ratio of actual site Chi/Q values to the postulated Chi/Q values will exceed the value of one as it is now. In other words, they have site-specific Chi/Q values as site characteristics in ESP. That number against the AP1000 final certification Chi/Q values, if you divide that number, you get more than one.

JUDGE WARDWELL: There's help coming from the foothills.

WITNESS RAMSDELL: Your Honor, may I address this issue, please? There was a matched set here related to the design. There is a source term.

JUDGE WARDWELL: While you are speaking, could you put on --

WITNESS RAMSDELL: Oh, Van Ramsdell.

JUDGE WARDWELL: No, no.

WITNESS RAMSDELL: Okay. PNNL for the

record.

JUDGE WARDWELL: That's not why I was interrupting you, but it's good you did that.

Could you put on slide 35 for me?

WITNESS RAMSDELL: There is a matched --

CHAIRMAN McDADE: Excuse me. Also, the record should note this is Mr. Ramsdell speaking.

WITNESS RAMSDELL: Yes.

JUDGE WARDWELL: He did that. I interrupted.

CHAIRMAN McDADE: Sorry.

WITNESS RAMSDELL: There is a matched set. It's a set of source terms, a dispersion factor called variously postulated hypothetical. I call it a design dispersion factor and the design dose, matched set.

As long as you take the ratio of the design dispersion factor and the site-specific dispersion factor and the dose that goes with that and you do the ratio as done, the design dispersion factor drops out and is no longer an issue, regardless of how it was determined.

JUDGE WARDWELL: In looking at 35, I don't think I can school you on mine like you people can, but the radiation dose right after the equals sign is the -- there you go. That's the dc radiation dose

that they calculated based on their Chi/Q factor, which is right at the bottom of the equation. So put a little line under that for me, if you would. There you go. Good.

Is that not correct that that's in the design certification, those two values are in the design certification?

WITNESS RAMSDELL: Yes, sir.

JUDGE WARDWELL: Okay. This atmospheric dispersion factor, the Chi/Q for the ESP, is in the site characteristic table, is it not?

WITNESS LEE: Yes, they are.

JUDGE WARDWELL: If, in fact -- and this equation is what is used to come up with the ESP radiation dose; is that not correct, at the ESP stage?

WITNESS LEE: I'm sorry? Would you repeat that question?

JUDGE WARDWELL: This equation is what is used to come up with a radiation dose for the ESP.

WITNESS LEE: Correct.

JUDGE WARDWELL: If the atmospheric dispersion factor doesn't change from the characteristic value that's in appendix A of the SER, then, in fact, this number won't change between the ESP stage and the COL stage. Is that not correct?

WITNESS LEE: I believe that's correct.

JUDGE WARDWELL: Thank you.

JUDGE TRIKOUROS: Are you done?

MR. MORRIS: Excuse me, Your Honor.

WITNESS LEE: Yes, just the conclusion section.

MR. MORRIS: Could I add a slight clarification? This is Marvin Morris for the applicant.

JUDGE WARDWELL: I am not 100 percent sure it's going to be a clarification, but fire away.

MR. MORRIS: I certainly hope so.

If you go back to that equation that Jay Lee had put up where it has the site Chi/Q over the design-certified Chi/Q, the concern with the current approved AP1000 parameters is that what we used initially, the design-certified Chi/Q was 6 times 10-4 to put a number to it.

Our site-specific Chi/Q was 5.95 times 10-4. Therefore, that ratio of the site Chi/Q over the design-certified Chi/Q was less than one. So that the site dose was less than the design-certified dose. Okay?

Since that time, the AP1000 design certification has come through. And their new Chi/Q

is 5.1 times 10-4. So if you divide our site Chi/Q, 5.95 times 10-4, by 5.1 times 10-4, you get a ratio larger than one. If you multiply that by the approved design-certified dose, you get a higher dose at the ESP site. In fact, it would be in excess of the dose limit.

JUDGE WARDWELL: So let me say --

MR. MORRIS: That's a problem.

JUDGE WARDWELL: Yes. So let me say it another. So the fallacy of what we just went through that I coerced the staff in agreeing to shouldn't be agreed to because, in fact, the atmospheric diversion factor, the Chi/Q value for the design certification, had changed from what you used in your ESP application and what now exists now that it's published for the AP1000.

MR. MORRIS: Yes. It changed it in the wrong direction.

JUDGE TRIKOUROS: Well, if we are done with that, yesterday we touched on a subject that I wanted to explore quickly.

CHAIRMAN McDADE: Did we bore you?

JUDGE TRIKOUROS: What's that?

CHAIRMAN McDADE: Did we bore you?

JUDGE TRIKOUROS: No, but I think you took

something easy and made it complicated.

CHAIRMAN McDADE: Perhaps. And I just want to make sure I understand. You described what the problem is. You described how it occurred. And at the conclusion of the presentation, the staff counsel is going to explain why that is not an impediment.

MR. WEISMAN: Yes, Your Honor.

CHAIRMAN McDADE: Okay. Thank you.

JUDGE TRIKOUROS: Yesterday we went into a lengthy discussion regarding the interfaces between the DCD and the ESP and the COL. And one of the questions that I had yesterday we kind of deferred was the fact that the DCD for the AP1000, for example, required an analysis of the liquid radwaste tank failure by the COL applicant. This was a statement in the DCD for the AP1000. This is an example.

And I asked the question how permit condition 2, which precludes any releases from liquid radwaste, would impact the choice of design basis accidents. And the specific question I wanted to get answered was, does permit condition 2 preclude the need to do a liquid radwaste tank failure analysis in the DBA for this plant at the COL?

CHAIRMAN McDADE: And if so, why?

JUDGE TRIKOUROS: Right. And if so, why?

WITNESS LEE: Speaking of liquid and gaseous tank failures, first of all, the staff no longer considered that as a design basis accident. That doesn't mean that we are not analyzing these tank failures. We just transferred this from chapter 15 to the chapter 11 for the radioactive waste management system.

So they will be analyzing this as a part of liquid waste management system and the gaseous waste management system.

JUDGE TRIKOUROS: Okay. That answers my question. So it will be analyzed, but it won't be a design basis accident anymore?

WITNESS LEE: Correct.

JUDGE TRIKOUROS: I thought that was going to be the answer, and that's good. So we're fine.

CHAIRMAN McDADE: Should we move forward to Mr. Ramsdell?

JUDGE WARDWELL: I would like to add one question to that.

CHAIRMAN McDADE: Yes?

JUDGE WARDWELL: And what is the reason and rationale for doing that?

WITNESS LEE: We have several reasons for doing that. Number one, the failure of the liquid and

the gaseous radwaste tank is really not associated with any reactor transient and not challenging the reactor fuel integrity and not associated with the reactor accident source term at all. In fact, the activity they allow in these tanks has limited radioactivity content controlled by plant administrative procedures and/or technical specifications.

JUDGE WARDWELL: But the real reason is because it is not related to the source term?

WITNESS LEE: Right.

JUDGE WARDWELL: Thank you.

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

A clarification. We within the environmental impact statement and for the safety analysis did not analyze for the failure of this radwaste tank. It is not within our standard review plan. So this will have to be a COL review.

JUDGE TRIKOURUS: I'm sorry?

WITNESS KLAMENTOWICZ: Dr. Lee just stated that this is no longer in -- the liquid radwaste tank accident is no longer within chapter 15 and that it's been transferred to chapter 11 for analysis. This was not reviewed by the staff in chapter 11.

JUDGE WARDWELL: So it hasn't been transferred?

WITNESS KLAMENTOWICZ: Not to my knowledge, Your Honor.

JUDGE TRIKOUROS: But that's part of COL. The COL will have to include a liquid radwaste tank --

WITNESS KLAMENTOWICZ: If it is not in the ESP, it's at COL.

JUDGE TRIKOUROS: Right, in chapter 11.

JUDGE WARDWELL: How -- what -- could you answer my question?

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

The staff will have to work on revision to its procedures and review standards.

WITNESS LEE: This is Jay Lee.

I guess I was speaking more in generic terms. For this particular Grand Gulf early site permit application, which refers to certified ABWR and proposed AP1000 design, in the case of ABWR, the ABWR vendor, General Electric, stated in their DCD document that all their indoor radwaste tanks will be housed within a seismic class I building and that building will have steel-lined all the way up to the height of a tank.

So in that ABWR, General Electric evaluated this tank, liquid tank failure. And that's why for referencing ABWR, I don't think we need any further evaluation just for the ABWR.

For the AP1000, they stated in their DCD that all their radwaste tanks are also housed in a seismic class I building. But Westinghouse, they weren't sure whether the COL applicant will have steel lining in the wall to preclude any seepage. That's why they made it as a COL action item. And we will be reviewing that portion of liquid radwaste at the COL times.

So I was referring specifically to ABWR and AP1000.

JUDGE WARDWELL: As it stands now, it hasn't been reviewed as part of chapter 11 under radwaste handling? It has been reviewed as a design basis accident for an AP1000? So it will have to be captured in some fashion at the COL stage?

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

That's correct.

JUDGE WARDWELL: Thank you.

JUDGE TRIKOUROS: I want just one other confirmation right now. All of the design basis

analyses utilized the ABWR or the AP1000 and no other plants?

MR. MORRIS: This is Marvin Morris for the applicant.

We did do a loss of coolant accident for the ACR-700, but that was the only accident we evaluated for that plant.

JUDGE TRIKOUROS: Okay. So there was one other plant used and only for the LOCA. And it was the ACR-700?

MR. MORRIS: Right.

JUDGE TRIKOUROS: And there were no other of the plants utilized? For example, tube rupture came right out of the AP1000?

MR. MORRIS: That is correct.

JUDGE TRIKOUROS: Okay.

WITNESS LEE: This concludes my presentation.

JUDGE TRIKOUROS: And that's because the ACR-700 LOCA was the worst case?

MR. MORRIS: That was the only accident we had sufficient data on from the vendor was for the LOCA accident.

JUDGE TRIKOUROS: The DCDs for the ABWR and the AP1000 didn't do a LOCA?

MR. MORRIS: No.

JUDGE TRIKOUROS: Did you say LOCA or did you say something else?

MR. MORRIS: We evaluated the LOCA for the ACR-700. We also evaluated the LOCA for the AP1000 and the ABWR.

JUDGE TRIKOUROS: So which was the limiting case? You just analyzed all of them?

MR. MORRIS: We analyzed all of them.

JUDGE TRIKOUROS: You just used all of them?

MR. MORRIS: Right, each one individually.

JUDGE TRIKOUROS: Okay. Okay. And there were no other analyses from any other plants?

MR. MORRIS: From any other plant type, no.

CHAIRMAN McDADE: Okay. Are we ready to proceed forward with Mr. Ramsdell's presentation?

(No response.)

CHAIRMAN McDADE: Nobody is stating to the contrary. I guess we are.

Sir, can you give us just a brief idea about how long you think your presentation will run?

WITNESS RAMSDELL: I will try to cut it short to get to the questions. I will skip the first

three slides and go right to slide 4 if that's acceptable to you and then cut that short also and come to the conclusion and move on to severe accidents.

CHAIRMAN McDADE: The reason I am asking this is just a question. I want to ask the parties whether or not they want to take a brief recess before your presentation or a brief recess after.

WITNESS RAMSDELL: I expect a reasonable number of questions related to severe accidents.

CHAIRMAN McDADE: Okay. Well, so we don't have a severe accident here, why don't we take a brief recess? Would 15 minutes be appropriate from the staff's standpoint?

MR. RUND: Yes, Your Honor.

CHAIRMAN McDADE: The applicant?

MS. SUTTON: Yes, Your Honor.

CHAIRMAN McDADE: Okay. It is now ten minutes of. If we stand in recess until five minutes after? We are in recess.

(Whereupon, the foregoing matter went off the record at 10:53 a.m. and went back on the record at 11:12 a.m.)

CHAIRMAN McDADE: By way of a preliminary, I understand from Ms. Wolf that the transcript issue

has been worked out. So, please, when we break again just speak with her and find out how it has been worked out and what, if anything, you all have to do. But I believe we have that taken care of.

Anything else before we get started?

MR. RUND: Before we get back in, during the last part of the presentation before we broke, there was electronic circling going on to some of the exhibits that were up there. I'm concerned that may need to become an additional exhibit.

I guess if it were just simply pointing, that may not have modified the exhibit, but we were circling equations. And I think for the record to be clear, that should probably come in as an exhibit if the Board wishes.

CHAIRMAN McDADE: Well, let me sort of interrupt here for a second on that. I think on the testimony that we have had before given the oral description of what was going on, that it will be clear from the record.

If that is done in the future and either of the parties believe that it would be helpful to the record to have that memorialized given the system that we currently have, it's possible to just take a snapshot of that with the markings on the particular

document.

And what we can then do is just simply have that marked. If, for example, we're on staff exhibit 19, you know, we can just identify that it's staff exhibit 19, what the particular page of the exhibit is and then just mark it as A. And it could be inserted in the record that way.

So it would be staff exhibit 19, page 38A. And we'll just put it in. And that will have the original. It will also have it with any particular markings on it.

So if at any time you feel that the marking is so significant that the oral description that accompanied it is inadequate or that the record would be improved by having that, just mention it. All we have to do is say, you know, sort of "So let it be written. So let it be done." And we will have it physically present here and just as a hard copy in just a matter of moments.

Technology is amazing.

MR. RUND: Yes, it is. I think that would be fine. I believe that was staff exhibit 19. Those markings could be --

CHAIRMAN McDADE: Well, the answer is no because now they are gone. What we have to do is take

a picture of it at the time that it is up. So, as I said, I believe on the ones that we have had before, where the witnesses have marked that they were articulate enough that their oral description adequately creates the record, if in the future either the staff or the applicant believes that it would be helpful, that perhaps they're not as articulate or we don't want to take the time to allow them to be articulate, we can just note it. All I have to do is just say we want to have that as an exhibit. It will be captured at that point. And you all will then have a hard copy of it in just a matter of moments.

MR. RUND: That's fine with the staff.

CHAIRMAN McDADE: Okay. Are we ready to proceed? Staff, anything further?

MR. RUND: Nothing further for the staff.

CHAIRMAN McDADE: Applicant?

MR. BESSETTE: We have nothing further. We are ready to proceed.

CHAIRMAN McDADE: Mr. Ramsdell?

WITNESS RAMSDELL: Van Ramsdell, PNNL, for the staff.

Starting with the design basis accidents, generally there are two types of information involved

in the design basis accident analysis. One is a set of values associated with the reactor design itself.

We have spent a good bit of time in the last few minutes discussing that. That set of information is a matched set. And we have had an exhibit the end of the last session, where the matched set has changed since the analysis the staff performed or the staff performed its analysis on a pre-certification of the AP1000. The AP1000 certified is not the one that we analyzed.

The second set of information that goes into design basis analysis is site-specific information. That includes the Chi/Q or that is the Chi/Q, which includes the site-specific meteorological information plus information about the distance to areas of interest, the exclusion area boundary and the outer boundary of the low population zone.

The difference between the design basis accident analysis for the safety review and the design basis accident analysis for the environmental review is in Chi/Q, the site-specific information.

For both analyses, the exclusionary and the low population boundary are the same. For the safety analysis, the meteorological data is the same. However, we choose a value that gives doses that are

exceeded no more than five percent of the time, adverse meteorological conditions.

For the environmental review, we choose median values, more typical values. Thus, our doses are going to be typically less than or are always going to be less than the value calculated for the safety review.

Dose criteria. There are no unique dose criteria for the environmental review. I only present the dose criteria as a matter of reference.

On this slide, it demonstrates the examples or the differences between the two analyses. You notice that if you compare the exclusion area boundary doses for the FSER and the FEIS, that those doses for the FSER are about a factor of eight higher than the doses for the FEIS. That's within the range of normally expected differences.

The exclusion area boundary doses are for a two-hour period giving the highest dose. The low population zone doses are for the full course of the accident, which is up to 30 days. In the case of low population dose, the FSER doses are generally about a factor of three to four higher than the EAB dose because of the longer averaging period.

In the staff review of the environmental

report, the staff noted that the Chi/Q values in the environmental report were the same as the Chi/Q values in the SSAR. They were adverse meteorological values.

That was unacceptable to the staff. As a result, the staff used computer printout meteorological data provided by the applicant to generate the typical or reasonable median values for Chi/Q for the review and then conducted a review using the same calculations and the typical meteorological Chi/Q's in place of the adverse meteorological Chi/Q's. That's the only difference between the analyses.

In general, we relied upon the safety analysis people to make sure that the accidents were appropriate, so forth. We did go back and check a few of the source term values to make sure that there were no errors in transcription by going back to the original documents.

JUDGE TRIKOUROS: Did the staff have the ACR-700 source term?

WITNESS RAMSDELL: The ACR-700 has not undergone design certification. There is, I believe, a pre-certification notice, but it is not a certified design.

JUDGE TRIKOUROS: So you didn't have

access to that?

WITNESS RAMSDELL: We did not have access to that.

Are there any questions related to the differences between the staff's design basis accident review for environment and for the safety side?

CHAIRMAN McDADE: I don't believe so.

WITNESS RAMSDELL: If not, then we will go to severe accident analysis. Severe accidents are only analyzed on the environmental side. In its environmental review, the staff considered probability-weighted consequences of severe accidents for the ABWR and the AP1000 reactor designs. Severe accident evaluation uses reactor design-specific information on release categories, core damage frequencies, and isotopic releases.

This information, which comes from the design certification review, was only checked for accuracy. We didn't go back and verify anything that had been done prior to that.

JUDGE TRIKOUROS: This reactor input we're talking about is internal events only?

WITNESS RAMSDELL: It is internal events only.

JUDGE TRIKOUROS: Why didn't you include

external event --

WITNESS RAMSDELL: The short answer -- and I'll get to it later -- is the staff has not accepted any numerical values for core damage frequencies for external events for either the AP1000 or ABWR.

JUDGE TRIKOUROS: Well, maybe they didn't accept --

WITNESS RAMSDELL: I would like to hold that off and treat that at the end of the --

JUDGE TRIKOUROS: That's fine.

WITNESS RAMSDELL: -- at the end.

The additional input to the severe accident review included one year of on-site meteorological data, land use data, and site-specific population data. Land use and population data were out to a distance of 50 miles from the ESP site.

Ultimately we calculated risk, which is the product of the core damage frequency and the consequence of the accident. The risks were compared with risks associated with current generation reactors and also with the Commission's safety goals.

The tool used to calculate the consequences of the accident was a MACCS2 computer code. It is a standard NRC/DOE-developed code. It has evolved over the last probably 20 to 25 years. It

goes back to NUREG-1150, WASH 1400, as predecessor codes.

The MACCS2 code uses an isotopic source term of 60 radionuclides. These 60 radionuclides account for 99 percent plus of the possible consequences of the accident.

JUDGE TRIKOUROS: Are these gaseous or liquid?

WITNESS RAMSDELL: This is a gaseous release.

JUDGE TRIKOUROS: Okay.

WITNESS RAMSDELL: Use a site-specific land use and population data, hourly site-specific meteorological data, which are binned into bin and then with a probability determined for each bin.

There are a number of ways of running the MACCS code with the meteorological data. You can use the bin data. You could actually run with a sequence of meteorological data. So it does have a time-dependent dispersion deposition model, but the time-dependent model was not used in this case, in these cases.

MACCS2 has a simple evacuation model. People are allowed to move radially outward at speed of about one meter per second after a predetermined

delay time. Then the output of a MACCS2 code is a set of probability estimates for dose, health effects, and economic impacts.

The MACCS2 code or the core damage frequencies that we used were for internally initiated events based on the design certification documents. We got the dose, health, and economic consequences from MACCS2 output.

The staff obtained the input deck from the applicant for their MACCS2 runs. We evaluated their input deck for reasonableness. And we reran the code using our own MACCS2, copy of MACCS2.

MACCS2 is a code that is maintained by Sandia Laboratory. And we have obtained our cost from them. We used the same version that the applicant used.

Then we took the output of the core damage frequencies set out by the code, multiplied them to get risk, which is a statement like population dose per reactor year, whatever, or number of cancers per reactor year and so forth.

JUDGE TRIKOUROS: And you used population estimates out to beyond the operating life of the plant, I assume?

WITNESS RAMSDELL: I don't believe we went

beyond the life of the plant. I don't recall specifically what the year was. It was a one-year. It was a population for a specific year. Perhaps the applicant can remember. And if not, I can look at the output of the code.

JUDGE TRIKOUROS: I just want to --

WITNESS RAMSDELL: We can give you the year later.

JUDGE TRIKOUROS: I just want to get it on the record that it wasn't using current population estimates. It was using population estimates throughout the life of the plant that at the very least --

WITNESS RAMSDELL: I will have to check to determine that.

JUDGE TRIKOUROS: That's fine.

MR. MORRIS: Your Honor, this is Marvin Morris for the applicant.

The population distribution was based on the projected population for the year 2070.

WITNESS RAMSDELL: All right. What has happened is we have an old -- there were supposed to be two tables here that have some of the numerical results in. Those were not captured. And I don't think you have them on this.

JUDGE TRIKOUROS: Are they specific tables from the FEIS?

WITNESS RAMSDELL: They are extracted from the FEIS. The first table compares the number of values with Commission safety goals. And I believe I -- the first column of the table -- no, I don't want to.

CHAIRMAN McDADE: Do you know what the figure is from the --

WITNESS RAMSDELL: We're checking now. No. The two tables I intended to show at this point were abstracted from table 5-15 of the FEIS and 5-16 of the FEIS.

The first column of the --

CHAIRMAN McDADE: Hold on just one second.

WITNESS RAMSDELL: Okay.

(Pause.)

WITNESS RAMSDELL: Pages 5-74 and 5-75.

CHAIRMAN McDADE: Okay. Thank you. And the FEIS has already been received in evidence. It's part of the record. So please continue.

WITNESS RAMSDELL: The first column of the table that I intended to present has the core damage frequency for the ABWR, the AP1000, and the current plant at the Grand Gulf nuclear station.

The core damage frequency for the ABWR is approximately 2 times 10-7 per reactor year. The AP1000 is just over 2.4 times 10-7 per reactor year. And the Grand Gulf nuclear station current value -- this is based on NUREG-1150 -- is 4 times 10-6 per reactor year, about a factor of 20 higher than either of the proposed plants of the advanced plants.

The population doses for the three plants are in the second column, the ABWR, the population dose projected risk, dose risk, is 2 times 10-5 sieverts, person-sieverts, per reactor year.

The AP1000 projected dose risk would be 1 times 10-4 person-sievert per reactor year. And the Grand Gulf nuclear station dose risk is 5 times 10-1 per reactor year, more than three orders of magnitude higher risk.

From that, it's clear that considering the precision of the numbers involved, that the population dose risk for the Grand Gulf site, ESP site, given all three reactors, given the current reactor plus either of the other reactors would be essentially equivalent to the risk of the current reactor. You have 5 times 10-1 plus 2 times 10-5 is still approximately 5 times 10-1.

The last two columns in this table include

average individual fatality risks from cancer. The early risk for the ABWR and AP1000 are 2 times 10-14 or less.

The Grand Gulf nuclear station is 3 times 10-11 or less. And the safety goal if you put it in these terms is 5 times 10-7, the new designs plus the current reactor all much safer than the reactor safety goal. And I will get to that when we get back to external events. That difference is important.

For late cancers, the AP1000 is 2 times 10-11. The current reactor is 3 times 10-10. And the safety goal is 2 times 10-6. The ABWR is 3 times 10-12.

The safety goals are based on risk no more than one-tenth of one percent of the current accepted risk under current -- of normal events. So the reactors at the site with the scenarios, severe accident scenarios, fall within or are better than, much better than, the safety goals would require.

JUDGE TRIKOUROS: Has the staff reviewed these numbers in the AP1000 and the ABWR DCD? Those were part of the DCD review.

WITNESS RAMSDELL: The core damage frequencies came from the DCD.

JUDGE TRIKOUROS: Right.

WITNESS RAMSDELL: I did go back and check to see that the core damage frequencies were correct.

JUDGE TRIKOUROS: And the source terms came from the --

WITNESS RAMSDELL: The source terms may not have come from that. The output for the computer code indicates that the input values of the source term for the ABWR were based on a G.E. letter dated February 2nd, I believe, 2004.

The source term for the AP1000 came from a Westinghouse ORIGEN run. And the ORIGEN run was made in, I believe, July of 2001.

JUDGE TRIKOUROS: Hang on a second. ORIGEN run? Aren't we talking about now a severe accident analysis using something like MACCS or MELCOR that would generate those source terms, rather than a code like ORIGEN? The source term we're talking -- let me make sure I understand the source term.

WITNESS RAMSDELL: The source term was an input to MACCS. The MACCS acronym is MELCOR accident consequence code system.

JUDGE TRIKOUROS: Right. So typically a MELCOR run would precede a MACCS2 run, but as a surrogate for MELCOR, one could use a code like MACCS.

But we don't need to get into this. What

I need to understand is that the source term was either reviewed or not reviewed by the staff.

WITNESS RAMSDELL: The source term was not reviewed by the staff.

JUDGE TRIKOUROS: Okay. It was provided by the vendors.

WITNESS RAMSDELL: It was provided by the vendors. The source term is reactor consists of the reactor core inventory, which comes from in the case of the Westinghouse an ORIGEN run. The input to a MACCS code also includes a release fraction for each radionuclide group. The radionuclides are grouped by isotope into nine groups. And each group has its own release fraction.

JUDGE TRIKOUROS: All right. Well, I think that's fine. We have established that it was input data that was not reviewed, just accepted.

CHAIRMAN McDADE: If I could -- this may be a bit simplistic, but if you can answer it, the various figures that you gave; for example, the core damage frequency -- and you indicated that for the ABWR, it's 1.6 times 10-7. Can you describe for us how those numbers were derived, what the methodology was for coming up with that?

WITNESS RAMSDELL: It's done through a

probablistic risk assessment. I can generally describe what it includes, but I am not a PRA expert.

CHAIRMAN McDADE: If you can generally describe it?

WITNESS RAMSDELL: It involves identifying sequences of events and assigning probability to each step of the sequence and with ultimately determining a probability that there will be a failure and a release to the environment.

CHAIRMAN McDADE: Okay. And that is done initially by the applicant?

WITNESS RAMSDELL: It's done by the vendor.

CHAIRMAN McDADE: Excuse me. The vendor.

WITNESS RAMSDELL: Yes.

CHAIRMAN McDADE: Okay. And is that reviewed as part of the certification?

WITNESS RAMSDELL: Yes, that would be reviewed as part of design certification.

CHAIRMAN McDADE: Okay. And then the next figure, having to do with the population dose risk, can you explain how that figure is derived?

WITNESS RAMSDELL: The population dose is a calculated number by the MACCS code. The MACCS code takes the source term, does an atmospheric dispersion,

transport calculation, determines the exposures of individuals in terms of to various organs, and then uses a factor to convert dose into cancer.

In the case of economic effects, the code calculations deposition on the ground followed by -- within the code, there are rules depending on the external dose rate. You can do various things. People move and so forth.

CHAIRMAN McDADE: Okay. Thank you.

WITNESS RAMSDELL: The second table was a comparison of the ABWR, AP1000 reactors, and the current reactor with typical reactors that have undergone license renewal. They included a typical value, which is somewhere between mean and median, and the lowest current generation reactor value, which would be the best reactor as far as minimizing the impacts on the environment.

The ABWR and AP1000 core damage frequencies are an order of magnitude better, lower than the best of the current generation reactors. And if you go to get into population dose, the two advanced reactors are more than two orders of magnitude lower than the risks associated with the best of the reactors that have undergone license renewal.

All of these reactors -- and they're I think in the current generation. The analysis has been done or had been done at the time that this analysis was completed. There were about 29 reactors. Twenty-eight of those risk numbers had been calculated using the MACCS2 code.

In conclusion, the staff has evaluated the impacts, potential impacts, of the design basis accidents for light water reactors. And we believe that the three reactors we have looked at generally will bound -- and I say that with a grain of salt since the AP1000 has changed its numbers -- will generally bound the impacts of other light water reactors and that they are within or they will certainly for the environmental purposes be within regulatory limits.

Severe accident risk for light water reactors, again assuming that the ABWR and AP1000 are bounding reactors, particularly because of their size, they're within the Commission's safety goals and that the impacts would be of small significance.

JUDGE TRIKOUROS: I had asked the question about liquid releases before. Everything we talked about now is gaseous releases.

WITNESS RAMSDELL: That is right.

JUDGE TRIKOUROS: Liquid releases, do they not occur or is there some reason why they don't need to be looked at from a severe accident? Are there no liquid --

WITNESS RAMSDELL: I don't know. My initial reaction is that the liquid pathway, which is not considered in MACCS, would be to the basemat melt-through on the core melt accident. And that is addressed at the end of the severe accident discussion in the FEIS.

The staff during license renewal has assumed that the probability of basemat melt-through was 10-4 per reactor year. In discussing that with other members of the staff, we think that that is probably about three orders of magnitude too high an estimate for the advanced reactors.

Our rationale or our line of thought as to why that is too high starts with the probability of basemat melt-through ought not to be any larger than the total core damage frequency, which would get us down at least to 10-6 per year, leaving sufficient room for externally initiated events to give at least as much core damage frequency as the internally initiated events.

Further, not all core damage accidents

will go to basemat melt-through. And, finally, the reactor, advanced reactor, designs have design features to prevent basemat melt-through. Therefore, probably 10-7 would be a defensible number, rather than beyond 10-4.

JUDGE TRIKOUROS: So, in summary, you are saying that the reason that the FEIS did not consider liquid pathway releases for severe accidents was because the probability of that occurring is significantly less than the probability for a gaseous release?

WITNESS RAMSDELL: That's right. In addition, you start with the basemat melt-through into the water pathway. And the water pathway is considerably slower than the atmospheric pathways. So there would be time for mitigating action following the accident prior to it reaching uncontrolled area or leaving the site.

JUDGE TRIKOUROS: Okay. Well, let's let that go for now and move on.

WITNESS RAMSDELL: All right. I would like to talk a little bit about externally initiated events. The ABWR and AP1000 design certification process did consider externally initiated events.

In general, the -- or not in general. The

staff did not adopt any numerical core damage frequencies associated with externally initiated events. Rather, they chose to characterize them as very small, extremely small, which makes it difficult to calculate risk.

The staff has also looked at externally initiated events with respect to current generation reactors. NUREG-1742, entitled "Perspectives Gained From the Individual Plant Examination of External Events Program," summarizes much of the staff experience. And that experience generally has been that the core damage frequencies for externally initiated events are typically at the same magnitude or smaller than those from internally initiated events.

Therefore, the standard practice has been to use a multiplier on internally initiated events to account for externally initiated events. And, as was indicated in the slides and in the two tables we talked about in the FEIS, there is much room between the safety goals and risk associated with the proposed reactor types to have multipliers that are significantly larger than two and still be better than the safety goals.

JUDGE TRIKOUROS: All right. So you are

saying while you did not specifically include external events, you looked at the magnitude of external events versus internal events, concluded it would be approximately a factor of two and if you applied that factor of two to the conclusions that you reached for the internal events, you would be well within the limits that are set by the Commission?

WITNESS RAMSDELL: That is correct. And if I might add that the vendor of the AP1000 did look at and provide some numerical values for internal flooding and internal fires? And those were lower than the internally initiated events.

JUDGE TRIKOUROS: All right. Thank you.

CHAIRMAN McDADE: You were going to discuss cumulative impacts.

WITNESS RAMSDELL: Right, right. The staff did not do cumulative impacts on design basis accidents because design basis accidents, first, they're based on individual reactors; second, that we do not anticipate simultaneous design basis events at the same site. Therefore, the practice has been -- and we followed it -- not to do it cumulative.

And, as I mentioned earlier, we didn't specifically look at the cumulative impacts for severe accidents, but it's easy, very easy, looking at the

magnitudes to come to the conclusion that the risk of severe accidents will not change significantly by addition two of the advanced units at the Grand Gulf site.

That's it. Any further questions?

JUDGE TRIKOUROS: No. That's fine.

CHAIRMAN McDADE: Thank you, sir.

JUDGE TRIKOUROS: I have got to just make this statement. External events are common mode to sites, aren't they? So while I still think that the numbers appear to be extremely small, it is probably just worth stating that if external events were explicitly considered, it isn't clear to me how that would apply on a site level.

WITNESS RAMSDELL: My initial thought related to external events is that they apply to things like loss of off-site power, but it appears to me looking at the DCD and the discussion in the DCDs that internal and external are more related to the reactor system than it is to the site as a whole, that both the ABWR and AP1000 did look at seismic events. And in neither case did they come up with a core damage frequency. They used a different analysis approach.

The ABWR also looked at tornadoes and the

impacts of tornadoes again. In looking at the description of the externally initiated events that were in the DCD or FSER for the design, there were things like internal flooding from fire lines, internal fires within the plant affecting controlled systems or other wiring and so forth. I think that's what they mean by external events, is something outside of the reactor system itself that impacts the reactor system.

JUDGE TRIKOUROS: Thank you.

CHAIRMAN McDADE: Was the staff going to present testimony concerning the technical feasibility of permit condition 2 at this time or --

JUDGE WARDWELL: I've got some questions on I.

CHAIRMAN McDADE: Okay.

JUDGE WARDWELL: Just a few. And I think they deal mostly with the monitoring program for radiological releases. Starting off looking at answer 3 on page 4, the first paragraph, first full paragraph, halfway down, the sentence starts, "Both surface and groundwater are monitored under the radiological environmental monitoring program."

Can you elaborate a little bit more on what that groundwater monitoring is? And what is its

purpose?

WITNESS HICKEY: If you will give me just a minute to pull out my reference material, I will answer that.

CHAIRMAN McDADE: While she is doing that, let me just ask, with regard to hearing issue I, how long does the applicant think they're going to need to present any supplementation with regard to this hearing issue?

MS. SUTTON: Your Honor, the limited amount of supplementation we have will be reserved until after staff counsel discusses the ESP and how it relates to the possible siting of an AP1000. I think that would be very limited supplementation, whether that's going to occur now or later in the proceeding.

CHAIRMAN McDADE: Okay. Thank you.

WITNESS HICKEY: This is Eva Hickey.

The groundwater sampling that we're talking about is part of the radiological environmental monitoring program. And there is a report, annual report, that comes out called the "Annual Radiological Environmental Operating Report."

In that report, it identifies two groundwater wells that are sampled on an annual basis. And those wells are located, one of them is located in

Port Gibson. And then there's another well that's located -- I believe it's on site. It says it's .4 miles in the sector G radius. And, actually, if I misspeak or there's more information, perhaps the applicant can help with this.

These wells are monitored annually. And they are analyzed for gamma isotopes and tritium. And they are just part of the routine program that includes air monitoring and TLDs. It's part of the complete monitoring program.

JUDGE WARDWELL: Did I understand your testimony correct to say that you reviewed all of the monitoring for radiological releases, including this groundwater monitoring, and deemed that it's an adequate program to continue forward with the ESP site?

WITNESS HICKEY: That's correct, using the guidance in the ESRP and what is laid out in that guidance as to what's important to determine a pre-operational program. And because this is a program that is already in place and approved by the NRC, we determined that this program is appropriate for the early site permit.

WITNESS KLAMENTOWICZ: And this is Steve Klamentowicz for the staff.

I would like to add that it is also pat of the NRC's inspection program. Inspection procedure 7-11.22 specifically looks at any operating sites' environmental monitoring program. So this is also reviewed on a periodic basis, the adequacy of their program and their documented inspection reports to demonstrate that.

JUDGE WARDWELL: Thank you. On answer 6, page 11 --

MS. EVANS: Lori Evans for the applicant.

If you'll excuse me for a moment? I just wanted to clarify or add that SERI exhibit 31 provides the location.

JUDGE WARDWELL: Could you identify yourself?

MS. EVANS: Pardon?

JUDGE WARDWELL: Could you identify yourself?

MS. EVANS: Lori Evans for the applicant.

SERI exhibit 31 provides the location of the on-site well that is sampled in relation to the ESP boundary and to the existing unit I.

JUDGE WARDWELL: Thank you.

CHAIRMAN McDADE: And am I correct that that was the well that you pointed out yesterday,

which was at the far-right hand side of the map and about midway?

MS. EVANS: Far left side, correct.

JUDGE WARDWELL: Moving on to answer 6 on page 11, the third paragraph down states that the FEIS presents a limited discussion of the groundwater pathway. Do you have a specific reference in the FEIS on where that limited discussion took place readily at hand?

WITNESS RAMSDELL: The groundwater pathway is -- this is Van Ramsdell for the staff -- 5.10.2.3 on page 5-78.

CHAIRMAN McDADE: Of the FEIS?

WITNESS RAMSDELL: Of the FEIS.

JUDGE WARDWELL: Okay. So what you are referring to in that prefiled testimony is not necessarily a description of the actual pathway, but you are referring to the section as labeled "Groundwater Pathway"?

WITNESS RAMSDELL: Right.

JUDGE WARDWELL: Is it fair to characterize that there's not much discussion of the actual pathway in that paragraph or its delineation?

WITNESS RAMSDELL: Yes.

JUDGE WARDWELL: Thank you.

Referring to 562 of the FEIS if you have that handy? And before I ask anything on that, let me just ask another general question. In regards to the monitoring plan, for whoever wants to answer this, how are any isotopes that result from any decay products of the gaseous effluents handled in regards to accumulation in the soil surrounding the plant and going radially away from that? And to what degree are those evaluated in relationship to their distance from the plant?

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

The NRC's guidance, the standard for radiological environmental monitoring programs requires air sampling stations in the predominant direction of the downwind direction of any effluents. So it requires air sampling for iodines and particulates.

There is also vegetation sample requirements. And there are soil sample requirements. And this is all directed towards the predominant downwind directions.

There is also a control location at a distance beyond five miles in the opposite wind direction. So the air, the vegetation, and the soil

samples will pick up any particulates that fall out from any gaseous effluents.

There is also milk sampling for the iodine pathway. So the NRC guidance does cover the TLDs. So we cover direct radiation, the particulates, and iodines that could deposit on the ground or in the vegetation.

JUDGE WARDWELL: About how far away from the plant are these stations established?

WITNESS KLAMENTOWICZ: They are typically within five miles of the -- well, within five miles. There's a ring of TLDs at the site boundary or just beyond. And then the other sampling stations are generally right beyond the site boundary to a maximum of above five miles.

JUDGE WARDWELL: Thank you.

MR. MORRIS: This is Marvin Morris for the applicant.

A complete listing of all the sampling locations is in SERI exhibit 17.

JUDGE WARDWELL: Thank you.

Referring to the FEIS now on 562, and I'm looking at the first paragraph. And I guess it's the second full sentence, "The staff reviewed the documentation for the REMP and the Grand Gulf off-site

dose calculation manual and recent monitoring reports from SERI and the State of Mississippi and determined that the current operational monitoring plan is adequate to establish the radiological baseline for comparison with the expected impacts on the environment related to the construction and operation of the proposed new units at the Grand Gulf ESP site."

And it's still your professional opinion that the two wells in regards to groundwater monitoring meet that particular requirement for adequacy?

WITNESS HICKEY: This is Eva Hickey.

Yes, it is.

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz.

That is within NRC regulatory guidance for a REMP.

JUDGE WARDWELL: Thank you. That's it.

CHAIRMAN McDADE: Okay. We have nothing further, I believe --

WITNESS KLAMENTOWICZ: Excuse me. This is Steve Klamentowicz for the staff.

CHAIRMAN McDADE: Yes?

WITNESS KLAMENTOWICZ: I would like to differentiate that from the discussion some questions

that were posed to me yesterday regarding inadvertent releases. This program was not specifically developed by the NRC to address the inadvertent releases that we have recently been investigating and as discussed in the lessons learned task force. So I would like to make it clear there are different purposes.

JUDGE WARDWELL: There's always danger adding a little extra testimony because you get extra questions.

WITNESS KLAMENTOWICZ: That's fine.

JUDGE WARDWELL: We appreciate the danger you enter into. That's not danger.

Just one question in regards to that. Is it true there are no current NRC regulations that require any type of monitoring for inadvertent releases or if there are to what degree and could you describe it?

WITNESS KLAMENTOWICZ: Steve Klamentowicz for the staff.

A very thorough discussion is contained in the lessons learned task force report. And possibly we should enter that into the record here as an exhibit. If you decide -- I apologize. I just drew a blank on your question.

(Laughter.)

JUDGE WARDWELL: It seems like you've used a technique I have of that, to start talking and hope you remember the question.

WITNESS KLAMENTOWICZ: Yes.

JUDGE WARDWELL: And it doesn't work for me very well either.

Now I hope I remember my question, too.

WITNESS KLAMENTOWICZ: I did not take my ginkgo biloba this morning.

(Laughter.)

JUDGE WARDWELL: Basically my question was, is it true that the NRC does not currently have any regulations to require monitoring for inadvertent releases?

WITNESS KLAMENTOWICZ: That's correct.

JUDGE WARDWELL: Thank you.

CHAIRMAN McDADE: Anything further?

(No response.)

CHAIRMAN McDADE: Okay. I think we are going to get into issues regarding permit condition 2 and accidental releases. But before I do, yesterday there was a discussion of whether or not we should just continue forward through lunchtime and finish the hearing without breaking for lunch or whether we should break for lunch.

What's the staff's position at this point in time? Do you want to just keep going through or do you want to take a luncheon break?

MR. RUND: The staff is ready to go forward a little while longer, but if it's going to run too much longer, I think that maybe it would be a good idea to take a short recess for lunch.

CHAIRMAN McDADE: Well, I mean, what we could do is take a short recess of, you know, like ten minutes and then come back in and finish this thing out. What is the applicant's position on that?

MR. BESSETTE: We would fully support continuing on. We had several witnesses who were trying to catch planes at the end of the day. And we had hoped to allow them to do so.

CHAIRMAN McDADE: Why don't we try to accomplish that and maybe to allow people to get witnesses here and present for this next phase take a very brief recess? Would ten minutes be enough to get your witnesses here?

MR. RUND: Yes, that would be fine.

MR. BESSETTE: We agree.

CHAIRMAN McDADE: Before we break at this point, we have had discussions. Do we need any further witnesses on this or do you just want to have

some comment on it?

MR. RUND: Regarding permit condition 2?

CHAIRMAN McDADE: Yes.

MR. RUND: I thought we had covered that, but if the Board -- so we are prepared to bring Mr. Bagchi back up, but if the Board has no further questions, we don't plan on presenting anything further on that.

JUDGE WARDWELL: But you are presenting something in regards to how the permit is going to be looked at.

MR. RUND: Yes. Yes, we are.

JUDGE WARDWELL: Mr. Weisman is going to be presenting something in regards to what the permit looked like. That's a separate issue from this.

MR. RUND: Yes, yes.

CHAIRMAN McDADE: And we are then going to have some -- I wonder if it is appropriate for us to indicate some of the additional questions so that they can guarantee that after we come back into the minutes, that they have the right people here.

Can you give a brief --

JUDGE WARDWELL: I guess I just want to make sure we're all in agreement that nothing more is needed on slides 51 and 52 of I, which I thought we

had covered in detail on Wednesday. I want to make sure the rest of the Board is comfortable with that.

CHAIRMAN McDADE: I think we are, and it was just simply if the staff believed that they needed any additional clarification, we were going to give them an option to do so. But if you are satisfied with the testimony that was given on Wednesday, we are.

MR. RUND: The staff is prepared to rest on that issue.

CHAIRMAN McDADE: Okay.

JUDGE WARDWELL: Do we have the handouts? We can do it during the break. What I did over the night is go through those appendix A and B questions that had some Board reply on them and eliminated those that I felt we have already covered.

And so we will get that to you so we can use that as a guideline. Rather than wading through the full appendix A and B and have to say, "No. We have already covered that, already covered it," I've sugared it down, if you will, to use a Maine term.

JUDGE TRIKOUROS: I just wanted to make sure that you understood my -- other than the ESP discussion, which I am quite interested in, I had one question regarding the rationale for which computer

codes get reviewed or don't get reviewed and how in a general level with the staff.

CHAIRMAN McDADE: Okay. And what we will do is take a recess now, give you that handout. We'll take a recess for ten minutes. If you feel that you are going to need longer than ten minutes, just knock on the door and let Ms. Wolf know how much longer more than ten minutes you will think you will need.

Well, why don't we say until about 20 after? It's about 12 after now. We'll take a recess until 12:20. If you need more time, just let us know. Otherwise we'll come back in at 12:20. Thank you.

(Whereupon, a recess was taken at 12:14 p.m. until 12:35 p.m.)

CHAIRMAN McDADE: The hearing will come to order. And let me just note I know that some of these questions may require something other than just the testimony of a witness. It may require a written submission.

We're not expecting to get that done before we break for lunch, but what we can do is take care of all the witnesses and then break and just get an estimate from you all as to when any additional written submissions that seem necessary in order to answer these questions can be provided.

Dr. Lettis, what time is your flight?

DR. LETTIS: It's at 2:30 from Dulles.

CHAIRMAN McDADE: Okay.

JUDGE WARDWELL: Well, we have got plenty of time, then.

(Laughter.)

JUDGE WARDWELL: You've got a whole 24 hours before you need to be there.

CHAIRMAN McDADE: And is that the only question that you're going to have any comment on?

DR. LETTIS: I have comments on 41 and 46, those two.

JUDGE WARDWELL: Shall we start with 41?

CHAIRMAN McDADE: Let's get that out of the way and get you out of here. That shouldn't take very long.

JUDGE WARDWELL: It shouldn't. The initial question was, what was the spacing of the borings along the Mississippi River that allowed the Army Corps of Engineers to conclude that the quaternary deposits are not faulted?

We had a response in a SERI input. And in SERI's response, they mentioned other sources that they looked at to use that to help them determine that the quaternary deposits were not deformed. And I just

was interested in what those other sources were.

DR. LETTIS: Thank you. This is Bill Lettis with the applicant.

As you know, Mississippi is in a low seismic environment, but for the investigation of permanent ground deformation, primarily the evaluation of the potential for capable faulting or fault rupture through the site, we performed field mapping in the site area.

We performed an interpretation of aerial photography to look for geomorphic features or features on the landscape that would indicate the potential presence of active faulting.

We reviewed existing published literature, including local geologic maps published in the site area to see if any faults had been mapped. We also looked at regional maps and regional cross-sections to understand the tectonic environment or basically the structural environment of the site area.

And we drew cross-sections, site-specific cross-sections, across the site using the bore hole data, both from the ESP investigation, plus from the site, the previous UFSAR investigation. And we presented several of those cross-sections as exhibits. And those cross-sections provide direct evidence for

the absence of faulting at the site.

Plus, none of the geologic maps published in the literature show any faults in the site area. And in our air photo interpretation, in field mapping, we did not identify any features that might be indicative of active faulting.

And so from those lines of evidence, we concluded that there is no potential for active faulting at the site.

JUDGE WARDWELL: Thank you.

Inquiry 46 dealt with foundation soil sheer wave velocities taken from some borings and then a straight line averaging that was done. And in the response, they talked about that step function.

And the final Board reply was, does it -- let me back up a bit. It said that "Based on engineering practice, experience, and judgment, a straight line average (a step function of soil foundation depth) was determined by visual examination."

The Board response to that was, "Does visual examination mean that the applicant manually placed a step function by placing a line where it appeared to best represent variations in the field readings? And then if so, what would be the

estimating error in the resulting function?

DR. LETTIS: Yes. This is Bill Lettis with the applicant.

The process used to develop the sheer wave velocity profile at the site was initially we performed a numerical averaging of the results so that we would have the average sheer wave velocities through the data using an Excel spreadsheet.

We provided that information to Dr. Walt Silva, who is the ground motion specialist that was used to generate the ground motion site response analysis. He's an author of NUREG-6728, which provides methodology for performing ground motion site response analyses.

So we provided the numerical averaging to Walt. Plus, we provided to Walt Silva, Dr. Silva, the geologic stratigraphy at the site. And based both on the geologic stratigraphy and the averaging of the profile that we provided to him, he then through his experience and judgment picked the velocity profile. And it was by visual examination based on his experience and judgment using the information that we provided to him.

JUDGE WARDWELL: And based on that explanation, would you agree that that type of

approach doesn't lend itself readily to determine any error bars around that particular line?

DR. LETTIS: No, it does not. I can say, though, that his selection of the line was plus or minus five percent in error from our numerically averaged values.

JUDGE WARDWELL: So looking at the extreme points that are away from that line, they only varied by more than five percent or whatever the number you just gave was?

DR. LETTIS: Right.

CHAIRMAN McDADE: Up to five percent plus or minus?

DR. LETTIS: Right. And then the variability around his visual pick in his analysis, in his calculation, he runs a randomization of the variability around his best pick. So it captures all of the range in the values around his best pick.

JUDGE WARDWELL: Thank you for that.

MR. BAGCHI: Your Honor, may I provide a clarification? This is Goutam Bagchi.

We have regulatory guide 1.165, which describes how to consider amplification at the specific site from the soil column. And soil column is described by different layers.

And the properties of the soil column are varied by using random process, Monte Carlo process, or some other methods. And variability in the sheer velocity is significantly dealt with in the regulatory guidance or regulatory guide 1.165 and the staff verification later on.

That was reviewed by Dr. Yung Li. And he may be able to provide more explanation about that, that the variability is indeed well-considered.

JUDGE WARDWELL: Thank you.

Dr. Lettis, appreciate your testimony this morning. And the methodological way and non-panicked way you presented it just now is indicative of your professionalism. And I appreciate that and certainly appreciate what you contributed earlier this week. It was most helpful. Thank you.

DR. LETTIS: Thank you.

JUDGE WARDWELL: Shall I move to attachment B now to achieve the same goals for --

CHAIRMAN McDADE: Yes.

JUDGE WARDWELL: And there isn't any specific order? If we just jump into it, is that --

MR. RUND: Yes. I think if we just move through --

JUDGE WARDWELL: It doesn't matter to us

because they're not in any particular order. They're in volume order. They're in a --

MR. RUND: Numeric order. It will be fine.

CHAIRMAN McDADE: It's just if there's one witness who is going to testify who has the earliest flight, to take up that question first.

MR. RUND: I think they're all on the same flight.

CHAIRMAN McDADE: Okay. And hopefully that flight will be this afternoon.

JUDGE WARDWELL: So we can judge the different personalities of the witnesses on how rapidly they speak when they try to answer. I just know I would be speaking a lot faster than Dr. Lettis did if I were in his particular position.

The first one was a general question dealing with the EIS. And I think the responses were good. The only thing we focused on at the end was the fact that SERI suggested that additional subcategories may possibly be added to the list of unresolved issues. And we were interested in just getting staff feedback on whether or not that is something that is appropriate.

And specifically I left in the Board reply

those two areas that were as part of our reply also, being the construction impacts on water and operational impacts on hydrologic alterations.

I just would appreciate your comments in regards to that suggestion by SERI.

MR. VAIL: This is Lance Vail for the staff.

We noted that suggestion that they be subdivided up. And at this point, we have no plans to make that change. And we would have to go back and see if there were any implications for other options.

WITNESS WILSON: Jim Wilson for the staff.

The NRC's assumptions regarding this issue are enumerated in appendix J of the FEIS. These assumptions are included in the bases for any staff conclusions on the issue, on any issue in the EIS.

Resolved issues have not been further subdivided. And the staff does not agree with SERI's suggestion. The subcategories of issues may be parsed into subissues that were resolved or subissues that were not resolved.

The bases for the staff's conclusions on the likely environmental impact to the proposed construction operation of one or more new nuclear units at the Grand Gulf ESP site is disclosed in our

NEPA document, the final environmental impact statement.

The FEIS does not address how the requested ESP would be implemented. The FEIS evaluated environmental impacts to determine which issues could be resolved absent new and significant information.

It also identified issues for which adequate information was not available, either was not provided by the applicant or did not exist, and issues which would need to be evaluated at the COL stage. These issues remain unresolved.

For each issue that could not be resolved, the text in the FEIS describes the extent of the staff's evaluation for context. If the Board elects to take an additional step to memorialize the bases and assumptions, then it could impose a permit condition in the ESP license that requires an applicant for COL to demonstrate that the key assumptions in appendix J remain valid.

This information would then be submitted in the ER accompanying the follow-on application. Absent such additional permit condition, the staff would rely upon the language in the rule that applicant must make certain demonstrations in its

CP/COL application and that the staff would need to verify likely be conducting audits of records and issuing a request for additional information that each of the key assumptions remain valid.

Is that responsive to your question?

JUDGE WARDWELL: It does very well. Thank you.

Inquiry number 3 dealt with a number of EIS issues. And, again, the responses were very good but raised other questions. And that's generally what happened here, as any of these dialogues were. We asked a question. And the answers were good, but then the answers raised other questions.

This particular one deals more with a legal issue, I believe, related to what is required of an EIS for an ESP when, in fact, minimal, if any, actual construction was taking place. And certainly in the Grand Gulf case, none is taking place.

And with that, why don't I turn it over to the legal side of this Board to discuss our approaches to address this issue? We don't feel it's a technical issue to be answered.

CHAIRMAN McDADE: Okay. I mean, I think probably the way we would want to do this is to simply put it at this point to the staff and the applicant.

This question has been raised. The matter has been briefed. After this evidentiary hearing is over, we can let the witnesses go. We can have perhaps a telephone conference to discuss whether or not further oral argument to be done to clarify the position of the staff and the applicant might be helpful or not. But it's something that we need not take up the witnesses' times while we do.

And when we break here today, if you're ready to discuss it, we can do so. And if not, we'll just set up a telephone conference in the near term.

MR. RUND: That's fine with the staff.

WITNESS WILSON: Could the staff offer two clarification points that might you sharpen that distinction when the time comes? Jim Wilson for the staff.

The no-action alternatives depend on the proposed action before the agency. At the ESP stage, the action before the agency is issuance of an ESP, which would have zero impact. The no-action alternative at that stage would also have zero impact because the comparisons between the no-action alternatives would be one for one. No action would accrue from either activity.

The no-action alternative, where no permit

was issued, and issuance of the ESP itself because it doesn't allow construction activities would likewise have no impact.

So as far as banking a site, the staff makes its judgment regarding whether there are obviously superior or environmentally preferable or environmentally superior sites. And that is the decision standard at this point. I'm not sure what you're looking for in the way of what the terminology of banking a site would refer to.

CHAIRMAN McDADE: Part of it, if I could, I mean, it's the no-action alternative. If the permit is granted, although there will be no immediate construction activity, there will be certain issues that are taken off the table that no longer will be needed at the COL stage to be reviewed either by the Board in a mandatory hearing or be subject to litigation by intervenors. Is that your understanding as well?

WITNESS WILSON: Yes, Your Honor.

CHAIRMAN McDADE: Okay. Does that affect the statements as far as the no-action alternatives at all of your view?

MR. RUND: Your Honor, if I may just interrupt? I mean, these really do sound like legal

issues. And given people are trying to catch flights, it may be better to defer these until later.

CHAIRMAN McDADE: I think that's probably a better way to handle it. We've got the position. Thank you.

JUDGE WARDWELL: Inquiry 16, "Explain how the Army Corps of Engineers attempted to stabilize the eastern bank of the Mississippi, the Grand Gulf area, and why the staff believes that this will be successful."

The final reply that we had is "Provide a map showing the location of any bank stabilization." But if you don't have that and want to just describe it, that's fine. If you would still like to provide a map and don't have it and would like to do it later at some future time, that's okay also. Any of those options are fine to address this. If you haven't prepared a map at this time, then it's obvious you can't in the three minutes that we're talking about.

MR. VAIL: This is Lance Vail for the staff. Staff exhibit 43 has been submitted. It's a scanned image of a map that was provided by the Corps of Engineers.

JUDGE WARDWELL: It's a little hard to read here. Oh, is the orange the stabilization area?

MR. VAIL: The colors designate depths and substrate types. And it's actually labeled. Unfortunately -- actually, can we zoom in? I think it's like a 30-megabyte scanned file. So if we can scan in further?

JUDGE WARDWELL: Well, what should I look for when I review that exhibit?

MR. VAIL: There's actually labeled along the river bank. It has the revetments actually labeled. You can start to --

MS. EVANS: Lori Evans for the applicant.

I can point this out on the map if it would be helpful.

JUDGE WARDWELL: Why don't you just orally say how they are represented on that map? I don't need to see it right now. If you can tell me how it is just because it's in the record? I see it now. And, in fact, with your assistance, I see where those are marked. And that seems sufficient. And we'll review that exhibit.

That addresses that question. Thank you.

CHAIRMAN McDADE: And given one of the things we said before, why don't we have a photograph taken of --

JUDGE WARDWELL: No. I don't think we

need one because these are several along the path. I just wanted to know what I wanted to look for. It's described there in the word "revetment." And so it's a pretty interesting key that they used. And I will be looking for that when I look at that diagram.

CHAIRMAN McDADE: We have the electronic one that can be blown up, as opposed to the hard copy version we have, where my eyes cannot read that.

WITNESS WILSON: The words on the figure read "Grand Gulf Revetment."

CHAIRMAN McDADE: Pardon?

WITNESS WILSON: The words on the figure read "Grand Gulf Revetment."

CHAIRMAN McDADE: From my standpoint, though, I would like a copy of this because this is blown up. And that way I won't have to go find it electronically. And by the time I've said that, it's now done. Okay. It just will be marked as exhibit 43A.

(Whereupon, the aforementioned photograph was marked for identification as Staff Exhibit Number STEX-43A.)

JUDGE WARDWELL: Number 29 talked about construction areas and forest habitat. And the final

Board reply was, "Where is serious commitment to recolonize the forest or wetland areas that are used for temporary construction areas?" Because in the response, it was stated that they did commit to do that. And we were interested in where would we find that.

WITNESS WILSON: Jim Wilson for the staff.

For reforestation and wetland restoration on site, the final EIS, page 4-57, at the top of the page, appears as a SERI commitment in the text.

JUDGE WARDWELL: And that's in the FEIS, did you say?

WITNESS WILSON: That's in the FEIS.

JUDGE WARDWELL: 4-57?

WITNESS WILSON: 4-57, yes. Yes, Your Honor.

JUDGE WARDWELL: Good. Thank you.

Thirty-one dealt with some questions of whether it's site parameters dealing with Benthick macro invertebrates and shoreline habitat. And the Board reply was, "Please clarify where in 10 CFR 51-71(d) does it state that the acreage of the Benthick and shoreline habitat does not have to be quantified beyond the qualitative information."

WITNESS WILSON: Jim Wilson for the staff.

10 CFR 51.71(d) states, "To the extent that there are important qualitative considerations or factors that cannot be quantified, these considerations or factors will be discussed in qualitative terms."

The staff's assessment of the information provided by SERI and through other published information about aquatic environments has been sufficient for evaluating impacts to the aquatic ecology from construction activities at the Grand Gulf site.

JUDGE WARDWELL: Thank you.

Forty states. "Please clarify if there is sufficient wastewater treatment capacity to handle the large construction force." And the one item that seemed to be left out, which I think will be easily clarified but want to make sure we get it on the record, deals not so much with off-site residential locations but what happens to all those people during the day in the capacity to handle those types of activities when they're actually doing construction.

MR. VAIL: This is Lance Vail for the staff.

In section 3.6.2 of their environmental report, SERI states that the sanitary systems

installed for preconstruction and construction activities would likely include portable toilets. I believe that's a standard practice that they use in refueling at this point, too.

JUDGE WARDWELL: Thank you.

Forty-one deals with the Katahoula formation not impacted from too much withdrawal. And the final Board reply was "In response to SERI's input, what treatment is needed if the Mississippi River is to be used as a water supply for the volume now proposed to be provided by on-site wells? And what are the potential environmental impacts?" SERI?

MR. CESARE: John Cesare with the applicant.

Water treatment, standard water treatment, systems would be used if we were withdrawing Mississippi River water that might include filtration, carbon filtering, chlorination.

Disposal would be standard techniques. If there were discharge to water bodies, it would be permitted. We would expect environmental impacts to be small.

JUDGE WARDWELL: Would you expect a separate intake for this or just using the same intake for any other makeup water that's proposed for the

rest of the plant?

MR. CESARE: It would be the same intake.

JUDGE WARDWELL: Okay. Thank you.

Seventy-four. The initial question was "Please explain the basis for Entergy's conclusion that Waterford-3 and Arkansas nuclear sites are less suitable than Grand Gulf and how to analyze that representation."

The follow-up reply by the Board in regards to SERI's input is "Please clarify the difference between deferring two sites from further consideration and eliminating those sites from consideration."

MR. ZINKE: George Zinke for the applicant.

The distinction we were trying to make was that relative to future ESP applications, future consideration of new plants that none of the sites were eliminated. With regard to the particular ESP application for the Grand Gulf, we went through the process and went through this prioritization process. And so they were in that context deferred and eliminated, had no difference in meaning.

JUDGE WARDWELL: So you are much more comfortable with saying they were lower-priority sites

for this EIS, rather than saying they were eliminated from consideration to avoid the negative word attached to those particular sites?

MR. ZINKE: Yes, sir.

JUDGE WARDWELL: Thank you.

Eighty-seven dealt with "As a conclusion of no significant environmental impacts would be avoided by the no action alternative." And I think this is back to the same issue again.

And, again, I left those in there mainly so that we would have the opportunity to decide how we are going to approach that. We decided it is a legal issue. And we will deal with that from that basis.

And did I miss a page? We're going that fast?

CHAIRMAN McDADE: We are going that fast.

JUDGE WARDWELL: Hot spit. Inquiry number 89, table 10-2 implies that it lists all of the unavoidable adverse environmental impacts from operations. And the initial question was, "How is this possible since hydrologic water use quality issues are unresolved?"

And the final Board reply was 87-1. And so that's the same issue also.

So we're done with attachment B. Does

anyone want to add anything else to attachment B before we move on to A?

MR. RUND: Staff has nothing further for attachment B.

MR. BESSETTE: We have nothing further on attachment B.

JUDGE WARDWELL: Let's go to attachment A. I think I will move right into it, even though people are shuffling around. And if the person isn't up there, as I move into it, then I'll just wait at that point.

But number two under attachment A, "In order to determine site acceptability, shouldn't the normal effluent evaluations consider the combined effluents of all plants?"

And the Board reply is basically saying that "Should not the cumulative effluent impacts for both the potential ESP plant or plants and the existing facility be evaluated for safety issues as well as environmental issues?" because my understanding is the effluent discharges are combined from -- the ESP PPE discharge requirements for that site are added to the plant one to look at the total impacts to the receiving body from an environmental impact approach. Why shouldn't the same thing or, in

fact, has it been done for the safety issues? Would you elaborate on that?

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

This puts me in an awkward position as the technical reviewer, I am required to follow the standard review plans and the ESRP guidance. This was not a safety issue that the staff was required to review. That's the way the regulations exist. And the standards and guidance of the staff follow that.

But, as you noted for the environmental impact statement, the staff did look at the cumulative impacts. It is my understanding that at the COL stage, the staff is required to do the cumulative impacts. And from a practical level, that's required because one of the regulations is to meet 40 CFR part 190, which looks at the entire site, the impacts from all units operating at the site. And so the 25 millirem standard looks at the entire site.

So from a practical limitation, there are only so many reactor units that can be put on a site and still meet the 25-millirem whole body requirement.

Appendix I to part 50 is on a per-reactor unit basis. So under that standard, multiple units can be cited. And they are judged on their own merits

on how much effluent is put out.

However, the staff is required, the criteria to look at 40 CFR part 190. So the cumulative impacts will be evaluated at the COL stage.

JUDGE WARDWELL: Doesn't that put the applicant at a bit of a risk that, in fact, looking at only the impacts from the ESP and walking away with a permit, saying, "Boy, we've got that banked pretty nice" and, yet, still looming out there, the site could, in fact, a site, not to say I'm referring to the Grand Gulf site, but I'm saying a site, in fact, could be unacceptable because there is so much existing impact that it is right on the edge of those regulatory limits and that any incremental addition would throw it over such that it would not meet the criteria when you look at the entire operations that occur on that site?

And it seems like the applicant would want you to look at both of those just to make sure that there isn't that looming out there.

WITNESS KLAMENTOWICZ: This is Steve Klamentowicz for the staff.

If the ESP, if the process to evaluate and grant an ESP only involved the safety side, I would agree with your statement. However, since it's the

staff requirement to perform the safety analysis and environmental impact statement, that gives the staff and the applicant some assurance because in the environmental impact statement, the cumulative impacts are evaluated. So they do look at what the maximum projected dose may be for the existing unit and any proposed units.

JUDGE WARDWELL: So even though it wouldn't eliminate getting an ESP permit, it certainly would raise a flag by looking at it from the EIS standpoint. And it would be well apparent if you were starting to approach that limit by the severity of the impact that would be assigned.

Does anyone else want to add anything to that?

(No response.)

JUDGE WARDWELL: Number 8 dealt with a PPE for thermal and electrical. And we talked about that quite a bit during the hearing. But one thing left over that I wasn't sure was fixed was in the Board reply, does not the capacity of the transmission lines depend upon the megawatts-electric and that megawatts-thermal? And if so, why is that not a PPE?

And I don't care who addresses that, whether it's applicant or --

MR. CESARE: John Cesare, applicant.

In terms of the duration of the applicant, Your Honor, the transmission system has a great deal of uncertainty. Additional generators could be added. There could be modifications to the transmission system.

It's very difficult to them specify the meaningfulness of a megawatts-electric at the time the permit is granted. It is more appropriate. And that parameter is also a derivative of the design, efficiency, cycles.

So it seems most appropriate that that not be a -- it's not a meaningful PPE postulated design parameter that would appear, I guess, from an environmental impact standpoint in attachment I.

JUDGE WARDWELL: Thank you.

JUDGE TRIKOUROS: But it may end up as a number in the permit because we discussed that the other day and that's what I thought I heard. But we are going to revisit that, right?

MR. CESARE: We would not expect megawatts -- I may have been misunderstood yesterday. We would not expect megawatts-electric to be listed in the permit.

JUDGE TRIKOUROS: Findings of fact and

conclusions of law specify 8,600 megawatts-thermal and 3,000 megawatts-electric.

JUDGE WARDWELL: That being just a statement and not a question if there's any other -- we'll proceed on.

JUDGE TRIKOUROS: I think they're searching for something, but we can pick it up later.

MR. RUND: This is Jonathan Rund for the staff.

I think this will come up later. And we will be prepared to address this when we go through our presentation.

JUDGE TRIKOUROS: Yes. Thank you.

JUDGE WARDWELL: I skipped over 3. I have to figure out where I want to put my notes. Anyhow, 3 says that "For each computer code analysis, provide a list of items that was provided in the response."

The Board noticed that at least two others were referenced in the SER would like the similar information, either now or at some point, to be added to that table or as a separate sheet for completeness unless there is some reason why they shouldn't be.

WITNESS LEE: This is Jay Lee.

I'll be just responding to one of two computer codes you listed. I will be responding to

RADTRAD.

CHAIRMAN McDADE: I'm sorry. Could you repeat that? I didn't hear you.

WITNESS LEE: Both brought up the question on the two computer codes in the question: NETVAD code and RADTRAD code. The question is asking why those two computer codes were not listed.

CHAIRMAN McDADE: Yes.

WITNESS LEE: That is the question. And my response will be just limited to one of those two computer codes: RADTRAD code.

CHAIRMAN McDADE: Okay. And?

WITNESS LEE: We did not use RADTRAD code in a radiological consequence evaluation of Grand Gulf ESP application. However, we did use that code for reviewing the staff's independent confirmatory dose calculations for AP1000 standard reactor certification review back in 2003 time frame.

So if the Board is still interested, I will be more than happy to describe this code in a few minutes. What I am saying is a step we could not use.

JUDGE WARDWELL: You are all set with that code?

JUDGE TRIKOUROS: What's that?

JUDGE WARDWELL: You don't need that

information, I think?

JUDGE TRIKOUROS: Not if it was used for DCD review.

JUDGE WARDWELL: Okay.

JUDGE TRIKOUROS: It's not our area.

JUDGE WARDWELL: How about the NETVAD code?

MR. ANDERSON: This is Joe Anderson of the staff.

The NETVAD code was used by the licensee at Grand Gulf unit I to develop the March 1986 evaluation time estimates. Subsequently, 2003, the licensee performed ETE evaluation.

In the SER, it's referred to as the May 2003 ETE study that examined the evacuation time estimates as determined in 1986 for the Grand Gulf ETE, looked through at the current population suing the new 2000 U.S. census data, projected 2002 population estimates, looked at evaluation of the current roadway conditions around Grand Gulf, other impediments that were known, like new population growth, shopping centers, large employers that may have been added, and also through interviews with state and local emergency management.

That May 2003 ETE study served as the

basis by the applicant for its preliminary analysis of evacuation time estimates that were for its ESP.

As far as the extent of the staff's review of a code, the staff utilized specific Northwest laboratories along with support form Sandia National Labs under contract as our technical experts for the staff. And they reviewed the use of a NETVAD code for evacuation time estimate modeling.

Both Pacific Northwest Labs and Sandia National Labs are familiar with the NETVAD model having reviewed ETEs that have reviewed this model and having reviewed comparison studies and reports of a model performed during the period before and after the Grand Gulf ETE.

The Grand Gulf ETE itself has been used at numerous sites. It's familiar as far as its capabilities. And reviewing the code, they did look at the results where the model was compared to other evacuation codes and exhibits similar performance and characteristics to that model or at that time.

As far as staff's evaluations of the inputs and outputs, what was performed just looked at the reasonableness of those inputs, not necessarily are they absolutely accurate.

In doing so, we look not only at the part

4 major features plan but also at the May 2003 study and back to March 1986 did a comparison of all of the inputs that were there, which did generate a number of RAIs to ensure we did have accurate information. That's a reasonableness that was being used.

As far as the results, Pacific Northwest Labs and Sandia did review the ETE results again for reasonableness. These results were compared to other sites with similar population densities and roadway networks.

Staff researched and reviewed the NETVAD model documentation studies performed before and after the 1986 ETEs and found it acceptable.

JUDGE WARDWELL: Did you happen to mention the revision number of that code in --

MR. ANDERSON: It was not documented in the part 4, preliminary analysis, nor in the 1986 study. So I do not have a revision of it. Thank you.

CHAIRMAN McDADE: Let me just add one thing by way of clarification. I just want to make sure. Were you previously sworn?

MR. ANDERSON: Yes, I was.

CHAIRMAN McDADE: Okay. Thank you.

JUDGE WARDWELL: Major feature H. I think we're on the last one unless I missed others.

Seventy-eight. And basically the Board -- in their input to their inquiry, SERI referenced their response to inquiry number 75. However, as I looked at that, they didn't have a response to 75.

Did I read that wrong or did you mean to reference some other number?

MR. CESARE: John Cesare, the applicant.

That was an editorial error. Our response should have been "No input."

JUDGE WARDWELL: Thank you. With that, that concludes it. I think I would like to take the opportunity now, rather than at the end, just to thank everyone but also to let you know how much I appreciate the high quality of the witnesses and the information provided by both the staff and the applicant.

The extent of the technical details and the response to our questions and in the prefiled testimony is a little more understandable because I'm sure through the number of months and years that the two parties have interacted on this, there had to be a tremendous amount of technical trust and comfort in each other. And we can see now that that inherently would develop in that time frame.

And the only comment I would have is just

keep in mind that we on the Board haven't been involved during all that time. That is why sometimes it may seem like we're asking lots of aggravating minutiae. In part, it's because we need to be assured that the review was done in a manner that could be defensible.

And some things are very apparent to the parties that are involved as we proceeded through that. And it's not apparent to us. And this hearing was extremely helpful to me to better understand the quality of the effort that was done. I just wanted to thank you for that.

I'm done.

CHAIRMAN McDADE: Do you have anything further?

JUDGE TRIKOUROS: I do have two quick questions. I want to second what Judge Wardwell said and add specifically those circumstances where you all may have developed presentations on the spot that, fact, were very helpful. I thank you for that.

I have two more quick questions. One has to do with computer codes. We had asked the question, "What analyses were done with computer codes?" And we asked a bunch of subset questions regarding the name of the code, the confirmatory analyses, the review of

the input/output, et cetera.

You responded with a rather detailed listing of all the computer codes that you used and answered all the subset questions. So we were happy to see that.

However, some of the answers to the codes indicated no review of input/output, no confirmatory analyses. One of the jobs that we have is to assure that nothing unreviewed is approved.

Therefore, I would ask the question. And I can be specific, of course, but I would ask the question generally. What was the logic associated with some codes getting detailed reviews and detailed confirmatory analyses and others not getting any input/output reviews and not getting any confirmatory analyses?

MR. ANDERSON: This is Joe Anderson for the staff.

I can talk to the NETVAD code, which is used for an ETE. Since the March 1986 was used as part of the original Grand Gulf unit I, its detailed review was done at the time of licensing Grand Gulf unit I.

The guidance that is out there in NUREG/CR-4831 as far as updating evacuation time

estimates basically has that --

JUDGE TRIKOUROS: I can stop you. I am satisfied with that code.

MR. ANDERSON: All right.

JUDGE TRIKOUROS: There are others that were in the response, ALOHA, SATI, and a couple of others, that indicated no review of input/output, no confirmatory analyses.

Am I to take it that there was no reasonableness review either or have these just passed through the system without any review by the staff? These are applicant analyses for the most part, I believe.

MR. HARVEY: Brad Harvey with the staff.

I can address the SATI code, which was used as part of the applicant's evaluation of the impact of the cooling tower plumes on the site. And my interest on the safety side is, is there a potential for these cooling towers to somehow impact the design and operability of the plant that could be located at the site? And I thought that there would be very low probability that that would be the case. And results of their model sort of confirm that.

So I didn't expect that there would be a major impact on the plant. And the applicant's

analysis demonstrated that.

JUDGE TRIKOUROS: So, in truth, you looked at the output from that code --

MR. HARVEY: The amount of the output that was provided as part of the application within tables that were provided within the application. I did not look at hard copy of the code.

JUDGE TRIKOUROS: If I asked the question, have any computer code analyses performed by the applicant passed through the system without any review, would the answer be yes or would it be no?

MR. HARVEY: Could you define the level of review that you're referring to?

JUDGE TRIKOUROS: Well, any review. I haven't seen anything that says even reasonableness review in terms of some --

MR. HARVEY: Well, the applicant did provide in general terms the inputs that they used. I did not look at the specific input decks that were used in the code. And the applicant did provide the summary of the output in the application. So I would say there was some review done on that code.

JUDGE TRIKOUROS: In every case where the applicant relied on a computer code analysis, they provided input and output? Is that what you're

saying?

MR. HARVEY: Well, they described some of the important input assumptions that went into the code, yes, --

JUDGE TRIKOUROS: All right. And the reason I --

MR. HARVEY: -- for SATI. I don't know if I can speak for --

JUDGE TRIKOUROS: The reason I'm concerned is in order for us to discharge our responsibility properly, we are supposed to reach a finding that everything has been properly reviewed by the staff so that your conclusions are supported and logically supported.

And these computer codes, there's a lot of important information that comes through the applicant to the staff through computer code analyses. The inputs to some of these things are very large and cumbersome and detailed.

And so I was rather surprised to see that there were some codes that don't appear to have been looked at from the point of view of the responses to our question.

MR. HARVEY: We did not expect that cooling towers would result in a site being classified

as being unacceptable for a plant. And so that's why we didn't go into a deep level of review of this particular --

JUDGE TRIKOUROS: Let me ask the question another way. Do you feel that any information passed from the applicant to you, the staff, and wasn't looked, at least from the point of view of the reasonableness of the input and output or output?

MR. BAGCHI: This is Goutam Bagchi of the staff.

Your Honor, results, data, analysis submitted in the application are done under oath and affirmation. Some of those are key to the staff's safety conclusions. Some are not. Those that are key to staff's safety conclusions, those are the ones that require scrutiny. Others are presented on the basis of the applicant's oath and affirmation.

There is a national standard that requires software quality validation and verification. And there is a particular branch that goes out and does an evaluation of the quality assurance program that's maintained by the applicant. And some of the things are sampled.

So there are various means by which the staff can determine whether or not the application has

been prepared with data and analyses that are appropriate for the staff to draw its conclusion.

As far as our -- I am particularly aware of the hydrologic area. In every section, we did independent analysis.

MR. RUND: This is Jon Rund for the staff.

Given the number of codes that are used in the analysis, I want to suggest a brief recess just so the number of witnesses that are involved in these different codes can confer briefly if the Board wants to further probe this issue.

JUDGE TRIKOUROS: If the witnesses aren't here, there's no reason to proceed.

MR. RUND: Well, rather than going code by code, I think if we just had a moment to just confer, it may help move this along.

JUDGE TRIKOUROS: That's fine.

MR. RUND: Thank you.

CHAIRMAN McDADE: Also, before you do, just one follow-up question, sir. I guess my question involves materiality. And by materiality, I mean, of consequence.

And, as I understood your testimony, if the particular data was going to be material; in other words, could affect whether or not the application

would be acted upon, then it was subject to review.

And that review has been documented in the environmental impact statement, the safety evaluation report, but that there was perhaps other data that in the staff's view was not material; in other words, not of consequence, would not have the potential to affect whether the application would be granted or not. And that would not necessarily get the same degree of scrutiny.

Am I correct in understanding your testimony?

MR. BAGCHI: That is exactly what I meant to say, Your Honor.

CHAIRMAN McDADE: Okay. Thank you.

JUDGE WARDWELL: And, Mr. Bagchi, were you speaking in regards to only the hydrology area or do you have enough experience that that is a standard practice through other areas within the agency?

MR. BAGCHI: My awareness of this standard practice of the agency goes back many years. So I would have to say that that is what I have encountered. There is standard review plan criteria that is going to substantial details with respect to treating results from computer code.

JUDGE WARDWELL: Thank you.

WITNESS WILSON: Your Honor, Jim Wilson for the staff.

From a process standpoint, the staff used the guidance in RS-002, which called for the staff in terms of some numbers to go and do a reasonableness check.

We did not go back and confirm or verify each of the numbers in the PPE. The staff did a reasonableness check to see if anything looked really out of line using this experience and judgment.

So I don't think we were required in every case to verify every number and go back and check the correctness of every value that was in SERI's application.

CHAIRMAN McDADE: But they were subject to a reasonableness check. And to the degree that they were material to your decision, they received in --

WITNESS WILSON: Yes, Your Honor, that is the criterion in RS-002, which the staff followed in doing both its safety and its environmental review.

JUDGE TRIKOUROS: So you are telling me that, at the very least, reasonableness was looked at with respect to everything submitted to you.

WITNESS WILSON: To the best of my knowledge, that is true, Your Honor.

JUDGE TRIKOUROS: Okay. That's what I expected to hear from you.

JUDGE WARDWELL: Do you think it is resolved now?

JUDGE TRIKOUROS: I will consider it resolved on the basis of that statement.

CHAIRMAN McDADE: Anything further?

JUDGE TRIKOUROS: Yes, just a quickie on climate change. I've got to get this one in just quickly. There was a power graph put into the EIS regarding climate change effects.

It was sort of a catch-all by the staff to say if there is any evidence of climate change, it will be evaluated. Just in terms of -- who does that? Is that the staff looking at that sort of thing or is the applicant required to do that as part of the COL when they come in and look at the new information at issue?

WITNESS WILSON: Van Ramsdell from PNNL.

WITNESS RAMSDELL: I would expect that that would fall under new and significant information.

JUDGE TRIKOUROS: So the applicant would be responsible for that?

WITNESS RAMSDELL: Yes, initial discussion of that. Yes.

JUDGE TRIKOUROS: Okay. That's fine. I don't need anything more. Thank you.

CHAIRMAN McDADE: Nothing further?

JUDGE TRIKOUROS: That's it.

CHAIRMAN McDADE: Do you have anything further? Anything based on what the staff said that the applicant would like to amplify or supplement?

MS. SUTTON: One moment, Your Honor.

(Pause.)

MS. SUTTON: We have nothing further.

CHAIRMAN McDADE: Okay. By way of administrative matters, then, what we're going to do is have a presentation with regard to the actual permit. Before we do that, with regard to exhibits, have you prepared an exhibit 1A and 1B, an updated witness list and exhibit list?

MR. RUND: The staff has not. We wanted to wait for today to finish up just in case anybody new needed to come up. But we will do that as soon as the hearing concludes and e-mail it to the Board as previously requested.

CHAIRMAN McDADE: I'm just wondering because I want that also included as part of the record. If you could also get an e-mail to the court reporter so that it can be sent there as well?

MR. RUND: We'll arrange to do that as well. Thank you.

CHAIRMAN McDADE: And the same with the applicant?

MR. O'NEILL: Yes, Your Honor. Actually, we have exhibits 1A and 1B ready to go. And I'll be happy to give those to the Clerk right now.

CHAIRMAN McDADE: Okay. That's --

MR. O'NEILL: And we'll follow that up with an e-mail.

CHAIRMAN McDADE: That's fine.

MR. O'NEILL: The other thing has to do with what I identified as staff exhibit 43A, which was the sort of photograph at the time. Unfortunately, when that gets blown up, you lose the writing.

So although I couldn't read it with my eyesight on the one that we had, I can't read it on this one either. So I don't know that it's worthwhile including it in the record. I think we'll just have to remember it.

WITNESS WILSON: Your Honor, the exhibit that was issued, you all have in electronic form. It's a .pdf file. And what you saw here was a 100 percent magnification. You can do that on your screen if you call it up electronically.

CHAIRMAN McDADE: Oh, no. That's what I understand, because when we called it up electronically, it was very readable. And we could see it. So now I've read it. I'll just have to remember it and remember where I could find it electronically. And if any subsequent tribunal is reviewing it, we have now talked about it enough that they should be able to find it as well.

The only other thing that remains has to do when it is likely that any comments, corrections on the transcript would be done by.

JUDGE WARDWELL: Are the witnesses released --

CHAIRMAN McDADE: Yes.

JUDGE WARDWELL: -- and people catching planes?

CHAIRMAN McDADE: Well, I thought it was only the other group that had to catch planes. But, in any event, is there any reason why they can't be released?

(Whereupon, the witnesses were excused.)

MR. RUND: Given that we have a time frame of when we're actually getting the transcript, I would briefly like to confer with my witnesses to see what their schedule looks like.

CHAIRMAN McDADE: Okay. Do you want to take, say, a five-minute break now? And then we'll come back with your presentation?

MR. RUND: Yes, Your Honor. Thanks.

CHAIRMAN McDADE: Is five minutes enough?

MR. RUND: Yes.

CHAIRMAN McDADE: Do you want ten?

MR. RUND: No. I think five should be fine.

CHAIRMAN McDADE: Okay.

(Whereupon, the foregoing matter went off the record at 1:36 p.m. and went back on the record at 1:48 p.m.)

CHAIRMAN McDADE: The first question, just do we have a reasonable estimate as to what would be doable as far as getting the revised transcripts?

MR. RUND: December 11st. Getting corrections to the transcripts?

CHAIRMAN McDADE: Yes.

MR. RUND: December 11st would work for the staff.

CHAIRMAN McDADE: Would that work for the applicant?

MS. SUTTON: Yes, Your Honor.

CHAIRMAN McDADE: Okay. We will set it as

December 11th. If it appears that you need to change that, just notify us.

MR. RUND: Thank you.

CHAIRMAN McDADE: Okay. And you will get us staff exhibits 1A and 1B by when? Close of business today or first thing Monday?

MR. RUND: Monday would be fine -- would be a little better just depending on how late we go today.

CHAIRMAN McDADE: Actually, you shouldn't say whether Monday would be fine or not, but you would prefer Monday?

MR. RUND: Monday would be better. If we get it done before business closes --

CHAIRMAN McDADE: That would be fine.

(Laughter.)

MR. RUND: Well, we will get it to you today, then.

CHAIRMAN McDADE: Okay. Are we ready to begin the discussion regarding the permit?

MR. WEISMAN: Yes, Your Honor.

CHAIRMAN McDADE: Does the applicant have anything to take up before that?

MS. SUTTON: No, Your Honor.

CHAIRMAN McDADE: Okay, sir. Please

proceed.

MR. WEISMAN: This is Bob Weisman representing the NRC staff. What I'm going to do is give a little bit of background, talk about a little bit of history behind rules. And that will give us a structure so that we will be able to see how the staff came to the form and the content of the early site permit, this model early site permit.

And then after that, I would plan to walk through the different provisions of the early site permit and maybe give you a little brief discussion of where each element or each provision comes from.

So, by way of background, as we all know, a primary purpose of part 52 is to resolve issues early in the process. Certainly a COL applicant can do that, just through a COL, resolve all the issues and obtain a COL before beginning construction.

There are two other things, obviously, a design certification and an early site permit, that will allow for even earlier resolution of issues.

The early site permit deals only with the siting issues. On the safety side, the Commission stated in the proposed rulemaking for part 52 that they thought that siting decisions should be made without detailed design information.

Some of this background is set forth in the staff pleading; the staff, NRC staff, response to petitioner's contentions regarding the early site permit application for the Grand Gulf site. That was filed on May 28th, 2004.

Just for your reference, if you look at pages 6 to 8 and pages 12 to 14 of that pleading, you will find some of this background set forth there in writing.

My reference to the proposed rulemaking, that is available at 53 Federal Register. That's at page 32-065. And that's August 23rd, 1988.

Having said all of that, we see that there are -- we know that previously in part 100, siting and design were intermixed, but in 1996, the Commission promulgated a revision to part 100 to partially separate the siting and design. And the design requirements were moved into part 50 with the siting requirements left in part 100.

And the Federal Register notice for that final rule, which is -- this is all recited in the staff brief -- is 61 Federal Register 65-157. It's December 11th, 1996. The rule, the new part 100 rule, became effective in January of 1997.

So if we turn to the regulations in part

52, that will give us, that is really going to give us, what the structure is of the early site permit.

Section 52.17(a)(1) defines the substantive matters that the staff is going to look into. That's contents of applications. And it essentially includes four matters.

There is a reference to section 50.34(a)(1), the radiological consequence evaluation factors, which we spent so much time the last couple of days discussing; part 100, which we have also spent a fair amount of time discussing; 50.34(a)(12) and (b)(6), which is a reference to appendix S of part 50, which has to do with seismic and geotechnical matters, primarily determination of the safe shutdown earthquake and the seismically induced flood, both of which will be reflected as site characteristics; and, finally, 50.34(b)(6)(v), which has to do with emergency planning, which we have also spent a fair amount of time discussing.

Section 52.17(a)(2) requires the submission of an environmental report. And 52.17(b) goes into detail as to what emergency planning standards are applied at the early site permit stage, so the main point being that the safety review that is done at the ESP stage is only for siting. It's not

for design. And that point is emphasized in the staff's brief in 2004.

I think that unless you have any questions on the background there, I will proceed to go through the provisions of the early site permit, the draft that we have provided as exhibit 50.

And I can tell you what section of the regulations they come from. And in some cases, I can give you a reference to the Atomic Energy Act and the findings there. But I can't do that for every provision.

If you will look at exhibit 50, item 1 is the findings that the Commission has to make in order to issue the early site permit. I'll give you a second to find that exhibit.

(Pause.)

MR. WEISMAN: I guess one other point I should add by way of background is that the form of this draft ESP, this draft model ESP, is modeled on the old construction permits and operating license, at least in part, insofar as they would apply.

(Pause.)

MR. WEISMAN: Should I proceed?

CHAIRMAN McDADE: Please.

MR. WEISMAN: Thank you, Your Honor.

So under item 1A, there is a finding there that the Commission has to make in order to issue the ESP that the application complies with the applicable requirements of the Atomic Energy Act and the applicable rules and regulations in the Commission and that required notifications to other agencies or bodies have been duly made. That is derived, in part, from section 185 of the act. It is, in part, also modeled on section 50.50 of the Commission's rules, which applies to construction permits and would be required under section 52.24.

Going on to item B, that is a provision that is explicitly require. It says, "Taking into consideration the site criteria, part 100, reactors having design characteristics that fall within the site characteristics and bounding parameters of the site." We would insert the name of the site." It can be constructed and operated without undue risk to the health and safety of the public.

That is a required finding explicitly under section 52.21. And it is somewhat similar to the finding required under section 50.35(A)(4)(ii) for a construction permit. I believe that that is also, in part, derived from section 81 of the Atomic Energy Act.

Item C is a reasonable assurance finding that the Commission makes whenever it takes a licensing action, whether it's an amendment, issuance of a license that there is reasonable assurance. That is derived from section 182(a) of the Atomic Energy Act for a construction permit. That would be section 50.40(a). And it's for an ESP required by section 52.24 of the Commission's regulations.

Item D is again one of those findings that the Commission must make when it takes a licensing action issuance. An ESP to the applicant will not be inimical to the common defense and security or the health and safety of the public. It's directly out of the Atomic Energy Action section 103(d).

And it's reflected in section 50.40(c) for a construction permit. Although it isn't explicitly identified in part 52, 52.24 would also require that finding.

CHAIRMAN McDADE: Before we go forward, let me just quickly inquire. The reasonable assurance that the applicant will comply with the regulations. What findings do we need to make with regard to that? And what is the factual basis? Is it a negative just simply if the applicant has demonstrated an ability and a willingness to comply with the regulations or is

there something more to it?

MR. WEISMAN: I think, Your Honor, for an ESP, especially for one such as this, where the applicant is not going to be engaged in any limited preliminary construction activities, there isn't really much for the applicant to do other than maintain its records so that they could be relied upon if the ESP is referenced in a COL or construction permit application.

I think that you don't have a factual basis for that finding is probably contained in chapter 17 of the SER. And it might also be, in part, based on a license condition or permit condition that we'll come to discuss in a few minutes, which has to do with part 21, requiring them to comply with part 21. I think that --

CHAIRMAN McDADE: But what I am asking is this. I assume, you know, as part of section 182(a) of the Atomic Energy Act, it was designed that individuals who were demonstrably of unreliable nature, anything else they still would not have a license if based on their past activities they had been proven unreliable or there was reason to question their reliability.

But my question is, if that isn't the

case, now, is there more to it than that? Does the applicant have an affirmative obligation to demonstrate its willingness and ability to comply with the regulations? And what exactly do we have to find about the applicant in order to move past this requirement?

MR. WEISMAN: Beyond what Your Honor mentioned, I think that there isn't anything else for this Board to look at.

MS. SUTTON: Your Honor, we would agree with that per 10 CFR 2.104(b)(2), which specifies the findings that the Board must make. There is no such affirmative finding that is required.

CHAIRMAN McDADE: But it is an affirmative finding that the Commission must make.

MS. SUTTON: That's correct.

CHAIRMAN McDADE: And if the Commission must make it, although the question is whether or not we have to pass on it as well. And it's the position of the applicant and the position of the staff that there is sufficient evidence in the record on which to make that finding but that we don't have to make it. Is that correct, that that is a decision for the Commission, as opposed to for this Board?

MR. WEISMAN: If you would let me confer

for just a moment, Your Honor, I would appreciate it.

(Pause.)

MR. WEISMAN: Your Honor, the staff believes that the Licensing Board is acting as the Commission's agent in this proceeding and so that it would be appropriate for the Board to make such a finding.

CHAIRMAN McDADE: And specifically you refer us to chapter 17 of the SER as the factual basis on which we can do that?

MR. WEISMAN: I think that that would be one basis. I also think that the license condition that I'll discuss later with respect to part 21 will also -- I think we can assume that the applicant will comply with the Commission's rules and regulations.

That is I think a standard rule of practice in a licensing proceeding and that given that condition, whatever records need to be maintained pursuant to part 21 will be appropriately maintained.

CHAIRMAN McDADE: Please continue.

MR. WEISMAN: Okay. We're now down to finding 1E, which has to do with emergency plans. And, as you can see, there are three different options listed in the model, the draft model, ESP. One is for complete and innovative plans. We don't have that

here.

We have a second provision that would apply to major features of integrated plans. That would follow section 52.18. And the finding with respect to the major features is a partial compliance with appendix E to part 50, which requires descriptions of the emergency plan. Insofar as the major features are described, they satisfy that requirement of appendix E.

I guess that second finding also includes the portion of the emergency planning with respect to significant impediments to emergency planning, which is required under 52.17(b) and is also addressed under 52.18. And that, of course, is supported by the analysis that is in chapter 13 of the SER.

JUDGE WARDWELL: We heard testimony that, in fact, the major features don't even carry over to the COL. But, regardless, because they proposed them, we should still make a finding of those that we feel are resolved is what you're saying here?

MR. WEISMAN: Yes, Your Honor. And provision 1F has to do with satisfaction of NEPA and part 51 of the Commission's regulations. I think it speaks for itself. It's simply a finding that NEPA and part 51 have been satisfied, which we believe the

FEIS discharges that obligation.

Item G has to do with the site redress plan. It doesn't apply in this proceeding.

Moving on to item 2, this is the embodiment of the Commission's decision to issue an early site permit to the applicant. It's based on the foregoing findings in section 1 of the draft model ESP.

And perhaps in response to one of your questions earlier, I noted that we did not have a place in this draft model ESP on the safety side, where thermal power level would show up. It may be appropriate to modify this section, section 2 here, to include that in the same way that is done for power reactor operating license to put the maximum power level there in that provision.

One other option, it could be put someplace else later on in the permit. And I'll get to that.

JUDGE TRIKOUROS: You said power level. What do you mean?

MR. WEISMAN: Thermal power level.

JUDGE TRIKOUROS: Is it just thermal power level?

MR. WEISMAN: Just thermal power level.

JUDGE TRIKOUROS: And that would be two thermal power levels?

MR. WEISMAN: A thermal power level per unit and a total thermal power level. I am not sure that we need to have -- I would have to consult with the staff, but I believe that that is correct. As a technical matter, whether you need to have both thermal power level for the individual reactor as well as the total for the site, my understanding is yes.

JUDGE TRIKOUROS: Just out of interest now, if 8,600 megawatts-thermal of HTGR is put on this site, it will have megawatts-electric capability greater than 3,000 megawatts-electric. Do you see that as irrelevant?

MR. WEISMAN: I see that as irrelevant. Yes, sir.

JUDGE TRIKOUROS: Even though any analyses that were done that were associated with megawatts-electric were done with no higher than 3,000 megawatts-electric?

MR. WEISMAN: Well, as a legal matter, as I said before, the analysis of the design will be done either at the COL stage or in the design certification. That should not have any effect on the site approval that the Commission would be making with

this early site permit.

Now, if you have any technical questions for the staff, we have asked them to stay so that they could answer them.

JUDGE TRIKOUROS: I would like to hear what the staff or the applicant has to say.

MR. ZINKE: George Zinke with the applicant.

If I understand the question, it had to do with if in this paragraph, the electric was not listed and the hypothesis was in multiple numbers of PBMRs that would exceed the electric, would the permit allow it?

The way we see that, the permit still would not allow me to put that many electric, but it wouldn't be because of this paragraph. It would be because of the other regulations and the other parts of the permit that are going to get into parameters.

And even without parameters, the regulations that deal with how the early site permit gets to COL, the restriction ends up in the part of the regulation that really deals with what happens at COL, that I can't get there, even though there are no words in the permit itself providing that restriction.

JUDGE TRIKOUROS: In the proposed findings

of fat and conclusions of law that we have been evaluating, it specifically says 8,600 megawatts-thermal only -- it doesn't say unit size -- or 3,000 megawatts-electric. So that is no longer -- that was what was submitted to us.

MR. WEISMAN: Yes, Your Honor. I believe that I can say now that we would probably want to revise that proposed finding to change it to megawatts-thermal only.

JUDGE WARDWELL: And to carry the thought process through, Mr. Zinke, those siting issues in the ESP that are influenced by the megawatts-electric would, in fact, have to be reevaluated if you were proposing something greater than 3,000 is what I kind of heard you say. Is that correct?

MR. ZINKE: That is correct.

MR. WEISMAN: Your Honor, maybe it might be a useful exercise to have a look at section 52.79, which governs the COL application and the contents. 52.79(b) states that the application, COL application, does contain the technically relevant information required of applicants for an operating license by 10 CFR 50.34. That would include a complete final safety analysis report, or FSAR.

As the applicant, Mr. Zinke and Mr.

Cesare, explained to you earlier, the applicant has described very clearly how they will migrate the ESP SSAR into the FSAR. So there is clearly a requirement there to do that.

In section 52.79(a), it describes how the application must contain, among other things, information sufficient to demonstrate that the design of the facility falls within the parameters specified in the early site permit.

Now, you have heard today how the staff and applicant and indeed the industry as a whole, all stakeholders, are clearly defining the difference between site and design characteristics, which are actual values, and site and design parameters, which are postulated in different parts of the process.

These regulations, written in 1988 and 1989, don't make that distinction so clearly. But we think that we can interpret 52.79 as I am about to explain with respect to what has to go into the permit.

And that would get us into item 3, which simply describes that "The ESP is deemed to contain and subject to the provisions specified in the Commission's regulations the act and so forth and is subject to the following conditions specified and

incorporated below."

So item 3A would be the site characteristics. And the discussion of this, I'm going to give the example of an applicant, COL applicant, referencing a design certification and an early site permit.

So in a design certification, section 52.47(a)(1)(3)(i) requires that design certification applicant to describe site parameters postulated for the design. Those are, among other things, the values of severe natural phenomena that are used as design bases for the certified design.

If those values fall within the site characteristics that are going to be incorporated into the permit, here is appendix A and established at the ESP site, then we know that that design can be built at this particular site.

To the extent that the applicant has used information that is not included in this certified design to show that it is practicable to build a facility at the site and we consider it in this proceeding, that information would be considered anew at the COL stage as to whether the design itself was adequate to justify that number.

In other words, as you have heard many

times over the course of the hearing, the staff did not evaluate the correctness of the design. That sort of thing is done in a design certification review. It's done in a COL application review. The staff simply looked to see if the designs were reasonable.

Now, obviously any certified design has been approved under the Commission's regulations. That's by definition reasonable. But there will be a review at the COL stage if a design that's not certified is applied for at that stage. And we'll have to see is the design bases are consistent with the site characteristics that were established in this proceeding.

So I would move on to item B, which includes controlling values of parameters. What this is meant to get at is that the existence of the plant in most cases is not going to affect the site characteristics, but there are a few areas -- I believe in this SER, it's hydrology -- where the existence of the plant can affect a site characteristics.

Therefore, to make sure that the site characteristic remains appropriately bounded at the COL stage, the COL application will have to show that those design parameters match the design parameters

used in the evaluation of the site characteristics at the ESP stage. So that's the purpose of that appendix.

JUDGE TRIKOUROS: These are design parameters?

MR. WEISMAN: And this is all in safety space. I want to make a very clear distinction between safety and environmental. And this entire discussion since I have been going through items 2 and 3 has been a safety discussion. All right? The environmental discussion will come in some later license conditions.

JUDGE WARDWELL: How does one know that as they read 2 and 3 that it is limited only to safety?

MR. WEISMAN: Because the characteristics that will go into appendix A are drawn from the SER. They were going to be drawn from appendix A of the SER.

We move on to item C. That's combined license COL action items. And, again, I think we have discussed this several times during the course of the hearing. Those will be drawn from the SER.

JUDGE TRIKOUROS: Just let me stop you. B.

MR. WEISMAN: Yes, Your Honor.

JUDGE TRIKOUROS: I haven't gotten past B yet.

MR. WEISMAN: Okay.

JUDGE TRIKOUROS: Can you give me an example of a B parameter?

MR. WEISMAN: I am not so familiar with the SER here, but I believe that my recollection is it is a flow rate for cooling water. Let me have a quick look at the SER, and I can tell you what they are.

JUDGE TRIKOUROS: All right.

(Pause.)

MR. WEISMAN: Yes. It's appendix A. It's table A.4. And there are only hydrology parameters here. They make up flow rate, make up water flow maximum, potable water, sanitary waste system maximum, demineralized water system maximum, fire protection system maximum.

JUDGE TRIKOUROS: All right. So what you are calling controlling parameters we have been referring all along in this application an bounding parameters?

MR. WEISMAN: They are also called bounding parameters in the title to the appendix in the SER.

JUDGE TRIKOUROS: Okay.

MR. WEISMAN: There is a description there that also refers to them as controlling PPE values.

JUDGE TRIKOUROS: We ought to keep consistent definitions or names. So that's what you're referring to, the very limited set of parameters in the PPE that are identified as bounding parameters?

MR. WEISMAN: Right. And they're identified that way because they have the potential to affect a site characteristic.

JUDGE WARDWELL: Your last statement confused me a little. I thought you said that those bounding values, appendix A.4, were those that might be influenced by the plant itself.

MR. WEISMAN: Yes, yes because the design of the plant --

JUDGE WARDWELL: Could influence it?

MR. WEISMAN: The design of the plant -- actually, I would go further than that. The design of the plant determines those flow rates.

JUDGE TRIKOUROS: That's true of many parameters, not just those.

MR. WEISMAN: Yes, but these are special because they can affect site characteristics.

JUDGE TRIKOUROS: Right.

MR. WEISMAN: The other plant parameters cannot affect site characteristics. So we already talked about item C. I'm going to move on to item D. And now we're in environmental. We're talking about the environmental parameters.

Values of plant parameters considered in the environmental review of the application as set forth in appendix D are incorporated into the permit. That is a complete set of the PPE used as the basis for the staff's environmental review and is set forth in, I believe it is, appendix I to the EIS. So that would be a complete set.

Now, why do we have to do that? The reason we have to do that is you don't know what the environmental impact of a plant is going to be unless you have some set of bounding parameters, as opposed to the safety side, where you can simply measure site characteristics, wind speed, seismic response curves, et cetera. You can't do that. You don't know what the effect of the plant is going to be unless you have a plant to analyze.

So the PPE of values allows the staff to do that. And the regulations in 52.79 required the COL applicant to show that their actual plant, the actual facility that they intend to construct and operate,

falls within the bounds of those parameters.

If the actual facility at the COL stage does not fall within the bounds, then the staff will consider the significance of that information. It may be significant. It may be not.

JUDGE TRIKOUROS: And this is where I keep coming back to this megawatts-electric, which is a parameter that was used extensively throughout the FEIS or the environmental report and the FEIS.

A lot of the environmental evaluations were done with explicit statement of certain megawatts-electric. I just want to keep making that point that it is a confusing point to me, that I could look at this document and see that assumption everywhere, in both the environmental report and the FEIS.

MR. WEISMAN: Your Honor, I can tell you for a fact that I know that the thermal power level is part of that plant parameter envelope that would be reflected in this condition D. I don't know for a fact if -- I haven't done a review to see if the electric power level is also listed there.

JUDGE TRIKOUROS: I will point out also that 8,600 megawatts-thermal doesn't show up anywhere. It's not a plant parameter envelope value at all. It

shows up in very limited -- I think it's only there a couple of times in the application, which I find kind of interesting that --

MR. WEISMAN: Okay. I would point out, though, Your Honor, that to the extent that a staff evaluation in the EIS is based on any certain megawatt-electric power level and a different power level were used at the COL stage, that would be new information, which the staff would evaluate for significance. So it need not be explicitly listed in order to come under that legal standard and be appropriately evaluated.

JUDGE TRIKOUROS: I understand. It seems like you have a sliding scale here.

MS. SUTTON: Well, we have multiple processes, as described in the earlier testimony regarding new and significant information. We agree with staff counsel on that point specifically.

JUDGE WARDWELL: And the PPE on the safety side is not listed in here for the reasons you have explained?

MR. WEISMAN: Yes, Your Honor.

JUDGE TRIKOUROS: Other than the bounding parameters, which I think come out of the safety --

MR. WEISMAN: Correct, Your Honor.

JUDGE WARDWELL: Light dawns on Marblehead. That's me, not anyone else.

MR. WEISMAN: Okay. So I would move on to condition F, "All other safety conditions identified in the SER were imposed by the Board or the Commission." I think that's --

CHAIRMAN McDADE: I think that's clear.

MR. WEISMAN: That's pretty clear. There's a similar condition on the environmental side, which is J listed in this model. I believe that G has to do with site redress. That doesn't apply in this proceeding.

I'm sorry. I skipped over E, which has to do with ITAACs for a complete and integrated emergency plan. That also doesn't apply in this proceeding.

H has to do with preliminary construction activities. That's not an issue in this proceeding.

JUDGE WARDWELL: Back to E quickly.

MR. WEISMAN: Yes, sir?

JUDGE WARDWELL: It says, "For complete and integrated emergency plans or major features of emergency plans." We do have major features. Do we not have to worry about it because we're not one of the first three applications filed?

MR. WEISMAN: The approach taken was to

compare the major features with the descriptions in appendix E as far as this proceeding is concerned, as I described earlier.

In future proceedings, the staff and other stakeholders have realized that there's another approach, which would be the submission of a complete description would satisfy appendix E, but an applicant could also submit ITAAC that would provide for the implementation of that description. And that would also be acceptable. That would resolve emergency planning issues well in advance of submission of a COL. The applicant and the staff did not take that approach here.

Condition I has to also do with limited preliminary construction work that applies here. That brings us to item 4, which has to do with integrated risk.

There are currently no admission regulations that address integrated risk. It wasn't considered in this application. It is something that the Commission is working on, the staff is working on anyway.

And to the extent that new requirements are imposed with respected to integrated risk, the Commission would have to meet section 52.39, establish

that it was necessary for adequate protection.

If the ESP were issued and the staff later determined that yes, it was an important issue, these ESPs would not be modified unless the standards in section 52.9 were satisfied.

JUDGE TRIKOUROS: Would this be in the form of person-sievert limit or --

MR. WEISMAN: I have no idea, Your Honor.

JUDGE TRIKOUROS: I guess by definition, risk would have to be that or at least that unit unless they referred -- this is risk. This is not probability. This is risk.

MR. WEISMAN: Well, in this model draft, it says "risk." I don't know if the term was used precisely there.

And, finally, the last two sections simply establish that -- well, number 5 is the provision I alluded to earlier, which imposes the obligation for the ESP holder to be in compliance with part 21. And that would I guess briefly require them to maintain the information that was the foundation for the granting of the ESP so that if later a defect could be identified, it would be possible to do that and comply with part 21.

And item 6 simply gives the effective date

of the ESP and its expiration date. And the appendices are as described in the various conditions that we went through.

I don't have any more. My presentation is concluded. If you have any questions, I will be pleased to address them.

CHAIRMAN McDADE: I don't have any further questions. It was very helpful. Thank you very much. I would ask whether or not the applicant has any supplementation or amplification that they would like to offer on this.

MS. SUTTON: One moment, Your Honor.

(Pause.)

MS. SUTTON: Your Honor, Mr Zinke has two points of clarification.

MR. ZINKE: George Zinke with the applicant.

The first point goes to earlier testimony over yesterday and today that earlier today I had indicated that we believe that the appendix J in the FEIS, that the Board did not need to come to a conclusion that it needed to be added as a special condition to the early site permit.

We continue to believe that and believe the explanation that has now come forward as far as

how the various pieces of the permit tie together. We support our belief in our conclusion.

The second point we wanted to make was also with regard to some testimony earlier this morning. There was a subject that came up and some things said about the AP1000. And when the comparison of the Chi/Q would occur and if the numbers were such that they didn't match or the comparison and the end statement before we went on to other subjects, I believe, was that would be a problem.

Again, as we now have gone through the permit and seen how the regulations from an early site permit standpoint, we don't see that that is a legal or a regulator problem. You know, the early site permit would specify what the parameters are. And as the regulations of the permit drive that at the COL phase and we select a technology, then the parameters and there characteristics get compared.

And the appropriate actions take place depending upon what that comparison shows. If they fall within, you do certain things. If they don't fall within, you do other things.

So we wanted to make sure the record didn't leave that there is some problem with the AP1000 or there is some flaw with the permit relative

to an AP1000.

JUDGE TRIKOUROS: And I think we could generally say there was nothing in the testimony that we have heard over the last two and a half days that would exclude any technology from being utilized at the COL stage in the sense of the seven, I think it's seven, plants that you have talked about in your application, that none of those would be excluded but some of them would require a lot more evaluation than others.

MR. ZINKE: That's correct. Likewise, we see that there is nothing in the permit that allows any technology without going through the process.

CHAIRMAN McDADE: Okay. Thank you very much. I think that concludes our hearing. The only remaining issue is we indicated earlier that one legal issue that we may or may not be requesting oral argument on.

What I would ask you to do is when you get back to your offices and check your schedules for next week and, again, that oral argument may be in person here or it could be done telephonically.

And just notify Ms. Wolf of any times next week that would be particularly inconvenient for you so that if we do need to schedule that oral argument,

we will be able to do it without unnecessary inconvenience.

Anything further before we terminate this hearing from the staff?

MR. RUND: No, Your Honor. Thank you.

CHAIRMAN McDADE: From the applicant?

MS. SUTTON: Nothing further.

CHAIRMAN McDADE: And, again, please convey to the witnesses you have called our thanks. We greatly appreciate the testimony given. We greatly appreciate the time they spent to be extremely well prepared and extremely knowledgeable and very helpful to us and extend our thanks to those who are still here and ask you to extend it to those who have left.

This hearing is now terminated. Thank you.

(Whereupon, the foregoing matter was concluded at 2:39 p.m.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Grand Gulf Early Site Permit Hearing

Docket Number: 52-009-ESP

Location: Rockville, Maryland

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.

Charles Morrison
Official Reporter
Neal R. Gross & Co., Inc.