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Evidentiary Hearing

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD PANEL

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EVIDENTIARY HEARING

In the Matter of: :

Calvert Cliffs Nuclear : Docket No. 52-016-COL

Project and UniStar Nuclear : ASLBP No.

Operating Services, LLC. : 09-874-02-COL-BD01

Combined License Application:

for Calvert Cliffs Unit 3 :

Thursday, January 26, 2012

Albright Building

Courthouse Square Conference Room

205 Main Street

Prince Frederick, Maryland

BEFORE:

RONALD M. SPRITZER, Chairman

DR. GARY S. ARNOLD, Judge

DR. WILLIAM W. SAGER, Judge

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P R O C E E D I N G S

9:30 A.M.

CHAIRMAN SPRITZER: We are here this morning in the matter of Calvert Cliffs 3 Nuclear Project and UniStar Nuclear Operating Services. This is NRC Docket No. 52-016. My name is Ron Spritzer. I'm an attorney and the chairman of this Licensing Board. I'll ask the other Judges to introduce themselves.

ADMIN. JUDGE ARNOLD: I am Gary Arnold. I am one of the Technical Administrative Judges.

ADMIN. JUDGE SAGER: My name is Will Sager. I am a part-time Technical Judge. I'm also a Professor at Texas A&M University in Earth and Environmental Sciences.

CHAIRMAN SPRITZER: Also with us to my left is our law clerk, Kirsten Stoddard. Our Information Services Technical Support person, Andy Welkie, and our Administrative Assistant, Matina Solomakos, is here somewhere, although I don't see her at the moment.

Let's have the parties and counsel identify themselves and we start first with the Joint Intervenors.

MR. MARIOTTE: This is Michael Mariotte,

Executive Director of Nuclear Information Resource Service speaking on behalf of the Joint Intervenors. with me is Paul Gunter from Beyond Nuclear, one of the Joint Intervenors. I want to inform you at this point that our witness is not here yet. He was scheduled to arrive on a flight from Central America at 6 this morning. And I guess he's still making his way.

CHAIRMAN SPRITZER: All right. Interesting issue.

(Laughter.)

Well, we'll proceed. I think we have about -- with opening statements we'll be here at least another half hour. I'll go ahead and admit the evidence, the written exhibits that is, and the pre-filed testimony. We'll probably be about 45 minutes at that point. If we get to that point, I guess we have the option -- well, let me ask -- let's go ahead and do the introductions first and I'll come back to that problem.

NRC staff.

MR. WILSON: Good morning, Your Honor, I am Anthony Wilson, representing the staff of the Nuclear Regulatory Commission. I'm joined at the table by Adam Gendelman. Also in attendance is Deputy General Counsel Sara Kirkwood. And also in attendance

is Emily Monteith. We're joined by our witnesses, Laura Willingham, Andrew Kugler, and Katherine Cort.

CHAIRMAN SPRITZER: And for the Applicant?

MR. REPKA: Yes, my name is David Repka with the law firm of Winston and Strawn, counsel for UniStar. And with me at the table is Mr. Tyson Smith, my partner at Winston and Strawn. Mr. Smith will have the lead on Contention 10-C. With me, of course, are our witnesses who will be introduced at the appropriate time and also Mr. Debbie Hendell, General Counsel of UniStar is with us in the audience.

CHAIRMAN SPRITZER: Okay, thank you. And for the State of Maryland?

MR. BOLEA: Good morning, Your Honors. Brent Bolea on behalf of the State of Maryland.

CHAIRMAN SPRITZER: Going back to the question of Mr. Sklar's presence, hopeful presence, why don't we go through the opening statements and the introduction of evidence. At that point, if he's not here, I think the Judges will take a break and confer and see what we, in fact, if anything we can come up with as a solution. I suppose one possibility -- let me ask the NRC staff about this would be to proceed with your witnesses first. When we had the prehearing conference I remember there was -- we sort of talked

about alternatives either having your witnesses go first or having the Intervenors go first. Is that feasible from the staff's point of view?

MR. WILSON: Yes, Your Honor.

CHAIRMAN SPRITZER: Do you have any objection to doing it that way if Mr. Sklar is not here?

MR. WILSON: We don't object.

CHAIRMAN SPRITZER: Does anybody else object to proceeding that way if that's what we have to do?

MR. SMITH: No, Your Honor, we have no objection to that.

CHAIRMAN SPRITZER: For members of the audience and both of the parties, the State of Maryland, we'd like to thank the Calvert County government for allowing us to use the Albright Building for this hearing. Also, again, thank you to the Calvert County Marine Museum which we used yesterday for the Limited Appearance Statement Sessions and all the Calvert County employees of which there have been a number of who have been helpful to us in arranging this evidentiary hearing, especially Ms. Debbie Shirley, but there have been a number of others as well.

We don't have an NRC facility down in Calvert County, unfortunately. If we're going to hold a hearing, as we prefer to do in the local community, to use facilities such as this that are provided by local government entities and we're very grateful for that opportunity.

For members of the audience that are members of the public and not witnesses or representatives of the parties, let me briefly explain who we are and what we're about. The Atomic Safety and Licensing Board panel consists of independent Administrative Judges appointed by the five-member Nuclear Regulatory Commission. As members of the Atomic Safety and Licensing Board panel, we are designated to serve on three-Judge Licensing Boards such as this. We do not work with or for the NRC staff who is a party in this proceeding. We have the authority to make an independent judgment as to matters that have been -- such as the Final Environmental Impact Statement that we're here about today, to review that and make our own independent assessment of whether it complies with applicable law.

Our decisions on hearing matters are generally subject to review, first by the NRC, that is, by the Commission, then potentially by Federal

Courts, even all the way up to the Supreme Court if they deem it appropriate.

We're here today to conduct a hearing on Environmental Contention 10-C. Let me, just for members of the public, give a brief statement of what Environmental Contention 10-C alleges -- well, rather than just reading it, let me summarize it. It is basically alleging that a portion of the Final Environmental Impact Statement is defective, that is the portion that deals with something called the combination alternative which is a combination of power sources, wind, solar power, natural gas, and several other sources. And the contention alleges that this combination alternative was defective, that is insufficient under the law because it failed to include a sufficiently large contribution from wind and solar power, thereby making the alternative overly dependent on a natural gas supplement and the resulting effects on the environment that the natural gas supplement would cause.

And we are here, as I said, to hold a hearing on that particular contention. There's at least one other contention pending before the Board dealing with foreign ownership, but we're not going to be addressing that contention today.

For those members of the public that may have cell phones with them, please turn them off or put them on vibrate. Please do not -- we have water for counsel at their tables, but other than that no food or drinks in this room. We will probably take a break, we will take a break this morning and then we'll break for lunch around 12:15. After that, we'll see how it goes.

A couple of administrative matters. First, we have two unopposed motions to file late-filed evidence. One of those was filed by the Joint Intervenors. The exhibits proposed for admission were JNT-32 and JNT-33. That was an unopposed motion, so we will grant that motion.

(Whereupon, the above-referred to documents were marked as JNT-32 and JNT-33 for identification and were received in evidence.)

Similarly, the Applicant filed a motion to file Applicant Exhibits 61 and 62. We will also grant that motion.

(Whereupon, the above-referred to documents were marked as Applicant Exhibit 61 and Applicant Exhibit 62 for identification and were received in

evidence.)

MR. WILSON: Your Honor, at this time staff was alerted to a technical error with one of its exhibits it was unable to open and at this time we would like to substitute what is marked as NRC 00033 with NRC 00033R which is the same exhibit, but it's in its full form. We have sent it to the parties and they indicated they did not oppose and we have supplied an electronic copy here today.

CHAIRMAN SPRITZER: Any objection?

MR. MARIOTTE: No, Your Honor.

CHAIRMAN SPRITZER: That will be admitted.

(Whereupon, the above-referred to document was marked as JNT-R1 for identification and was received in evidence.)

MR. WILSON: And we have paper copies if you'd like.

CHAIRMAN SPRITZER: Let's proceed to admit all the evidence that's been submitted by the parties. We'll start with Joint Intervenors. There was one question, I believe, on the Exhibit List. The version of Joint JNT -- originally, you had JNT 000001, I'll refer to that as JNT-1. The one that should be admitted I take it is JNT-R1?

MR. MARIOTTE: That is correct.

CHAIRMAN SPRITZER: That will be the one we'll admit and propose for admission. We also have JNT 2 through 23; 24 we are not admitting as a result of the staff's motion in limine. So we have JNT-R1, JNT-2 through 23; JNT-25 through 33, as well as -- yes, 25 through 33. Is there any objection to admitting those exhibits at this time other than we know the staff has a motion in limine.

I told you we're going to consider the arguments made in your motion in limine after we've heard the testimony. Subject to the objections made in the staff's motion in limine, are there any other objections to admitting the Joint Intervenors exhibits that I've just listed?

MR. GENDELMAN: Beyond their motion, the NRC staff does not have any additional objections.

MR. SMITH: UniStar has no objection.

CHAIRMAN SPRITZER: Very well, those will be admitted.

(Whereupon, the above-referred to documents were marked as JNT-2 through 23 and JNT-25 through 33 for identification and were received in evidence.)

CHAIRMAN SPRITZER: Let's move on then to

the NRC staff evidence. One other point I should make. Joint Intervenors Exhibit 30, the rebuttal testimony of Scott Sklar was not originally filed with an exhibit number, but it will be marked as JNT-30.

(Whereupon, the above-referred to document was marked as JNT-30 for identification.)

CHAIRMAN SPRITZER: And as I indicated, all exhibits from the Joint Intervenors will be admitted subject to the Board's review of the NRC staff's motion in limine.

Let's move on to the NRC staff evidence. Those exhibits, as I understand them, consist of Exhibits NRC 1 through 46. NRC 3 consists of two parts, that's the Final Environmental Impact Statement. And we'll include, as I mentioned, the NRC -- the revised version of NRC 33 that was just referred to.

With respect to those exhibits, is there any objection having them admitted at this time?

MR. MARIOTTE: If I could just make a very quick statement. Joint Intervenors believe in an open hearing and believe that -- and have no interest in preventing or objecting to anybody's testimony and so I just want to say that we're disappointed that the

NRC staff is continuing with its in limine motion. We appreciate the Board's ruling on the motion, but they are clearly the only ones trying to prevent some testimony. So having said that, we have no objection.

MR. SMITH: UniStar has no objection.

CHAIRMAN SPRITZER: All right, let me just go through that and make sure we're clear on the numbers. NRC 1 through 46 including the revised version of Exhibit 33 and also noted NRC 3 consists of two parts, Part A and B, and that is the entire Final Environmental Impact Statement, we'll have a complete enumeration of your exhibits?

MR. WILSON: Yes, Your Honor.

CHAIRMAN SPRITZER: Okay, those will be admitted.

(Whereupon, the above-referred to documents were marked as NRC Exhibits 1 through 46 for identification and were received in evidence.)

CHAIRMAN SPRITZER: And finally, the Applicant's evidence, that's Applicant 1 through 62 noting that the Applicant 17 consists of four parts A through D, any objection to admitting those exhibits at the present time?

MR. WILSON: No, Your Honor.

CHAIRMAN SPRITZER: Any objection from Joint Intervenors?

MR. MARIOTTE: No objection.

CHAIRMAN SPRITZER: All right, those will be admitted.

(Whereupon, the above-referred to documents were marked as Applicant Exhibits 1 through 62 for identification and were received in evidence.)

CHAIRMAN SPRITZER: Did I get a complete list of your exhibits?

MR. SMITH: You did. Yes, sir.

CHAIRMAN SPRITZER: All right, we'll now move on and hear opening statements. Our original proposal was to start with the Joint Intervenors for 15 minutes, maximum of 15 minutes I should say.

OPENING STATEMENT OF MICHAEL MARIOTTE, ESQ.

ON BEHALF OF JOINT INTERVENORS

MR. MARIOTTE: Thank you, Your Honor, and I appreciate the opportunity for an opening statement and I'll try not to take up the full 15 minutes.

As you mentioned, what this contention is about is that we're alleging that the Environmental Impact Statement prepared by the Nuclear Regulatory Commission under estimates the potential contribution

for solar and wind in the combination of alternatives. And this is important because it leads to an inaccurate conclusion about the potential environmental effects of the combination of alternatives versus the potential environmental effects of the proposed Calvert Cliffs 3 Nuclear Power Plant. And we believe that if the combination of alternatives is done properly, a different environmental conclusion may result. That's part of the purpose of NEPA is to reach that kind of conclusion and that's why this is an important contention.

I should point out that the EIS and NEPA, let's look at potential projects, feasible projects, not necessarily just those that are already existing or planned. In other words, the discussion on the combination of alternatives does not need to be limited to solar power and wind power projects that are on the books, but in fact, we have to look at what is feasible in this instance, what is potential in this instance.

The Calvert Cliffs reactor that has been proposed is admitted by its owners or by its Applicant as a cost over $10 billion. That can buy an awful lot of solar and wind power if the money were redirected

in that kind of technology. So we need to look at what the actual potential for Maryland is and not necessarily what is already on the ground.

With that said, we agree and have said so in our testimony that the combination of alternatives need not look at wild ideas, absolutely remote or speculative type things. We agree with that, but that's sort of a different standard than what is feasible. We would argue that, in fact, Calvert Cliffs 3 at this point is looking pretty remote and speculative itself.

We have provided evidence of some of Maryland's major private institutions, Washington Redskins, Purdue Chicken, General Motors, which are all building or have already built solar installations in this state. That kind of response from major companies in the state indicates that solar energy is certainly taking hold here in Maryland. Constellation Energy, which is the former partner to UniStar here, they're building new solar plants.

A condition of the merger between Constellation and Exelon that has come about since this case began is that this merged company must build even more renewables in this state. Since the merger isn't finalized, we don't have -- at least I don't

have exact numbers on what those are, but there's the intent that this new company build more renewables. And most importantly Maryland state law mandates renewables; 20 percent of the state's electricity provided by renewables by 2022. At least two percent has to be provided by solar power. That 2 percent equals about 250 megawatts of delivered power which is already more than 3 times higher than the NRC's Environmental Impact Statement says. And of course, the rest of that -- and the two percent is a floor, not a cap. So it certainly -- we can project more solar than that coming up and most of the rest of that is going to be met by wind.

So given the evidence that we've provided about the existing projects, about the known, planned projects, it's clear that this goal is feasible. It's certainly attainable. Overall, actually, the renewable sources by 2022 are supposed to by state law contribute about 2500 megawatts to Maryland, more than the Calvert Cliffs plant would produce.

The NRC is apparently assuming under the EIS that Maryland state law will fail or will not be implemented. We think that's an untenable assumption for a federal agency to make. We also argue that 2022 is a reasonable time frame to look at alternatives to

Calvert Cliffs 3. This plant doesn't have a license. The design is not certified. Even under the most optimistic schedule for the Applicant, we wouldn't be looking at construction beginning until about 2014. It takes a long time to build a nuclear reactor. Certainly, the prototype for this reactor is being built in Finland, as we speak. It was supposed to be built in four years. The current projection is nine years. And I think eight years from 2014, 2022 is a pretty realistic time frame to look at the alternatives. And so what we're trying to do is project well, what -- how much solar and wind as alternatives can be in place by that time.

And so the fact, and this is significant on one project in particular which is Bluewater Wind which recently announced that it's been put on hold for now. That's the new evidence that the Applicant submitted this week. And it is certainly true evidence. We don't quarrel with the evidence, but it remains within this time frame of the next ten years that offshore wind in Maryland, whether it's Bluewater Wind or another company, is certainly highly feasible.

This week I think perhaps yesterday, but I'm not sure, our Governor, Martin O'Malley, is submitting new legislation to encourage offshore wind

development in the state. So I think offshore wind is an idea whose time has come despite the Bluewater setback. And it's going to happen in Maryland sooner or later.

I wanted to talk for a second, a minute, about baseload power because this has become an issue in this contention. The NRC is arguing that well, solar and wind don't provide their concept of baseload power. So I think it's important to understand what baseload power and what it is intended to do which is provide reliable electricity.

So I want to quote from Amory Lovins, a well known energy expert, and this is from admitted testimony, an article called "The Nuclear Illusion" and unfortunately I don't have the number with me right now. But to quote this: "The word baseload is often misused to describe the power plants that big economies supposedly need. But in utility load dispatch parlance, baseload doesn't mean" --

CHAIRMAN SPRITZER: Are you quoting from --

MR. MARIOTTE: This is from testimony that was just admitted. It's an articled called "Nuclear Illusion."

CHAIRMAN SPRITZER: Do you remember the

exhibit number?

ADMIN. JUDGE SAGER: Exhibit 18?

CHAIRMAN SPRITZER: Your Exhibit 18.

MR. MARIOTTE: Our Exhibit 18.

CHAIRMAN SPRITZER: Sorry for interrupting.

MR. MARIOTTE: "But in utility load dispatch parlance, baseload doesn't mean big, steadily operating or dispatchable. It means plants that generate electricity at the lowest operating cost so they're dispatched whenever available, supplemented as needed by costlier to run plants. Thus, any renewable generator is run as a baseload resource because it has almost no operating cost. It's capital cost which must be paid whether it runs or not is irrelevant to this calculus. As explained below, no sensible criterion requires that a given power plant to be big nor to run steadily since many small plants, even variable ones, can add up to big and reliable supply as they increasingly do in competitive power systems that allow them."

Mr. Lovins goes on to point out that "Recent University of Kassel" -- that's in Germany -- "few experiments have confirmed that just integrated wind, photovoltaics, and biogas generation could

reliably provide all German electricity. The north German state of Schleswig-Holstein which got 39 percent of its 2007 electricity from wind power now aims for 100 percent by 2020 as it already achieves in windy months."

So the point here is that a properly designed system, electrical system, can in fact, use variable or intermittent power sources such as wind and solar and provide the functional equivalent of what's traditionally been thought of as baseload power. Personally, I think that the error of these large behemoth power plants from any kind of power source, any kind of fuel source is nowhere near an end because distributed, smaller scale systems are actually more secure and more reliable than building a 1,000 megawatt or more power plant of any kind that then needs 1,000 megawatts of backup power for when it doesn't operate because no power plant of any kind operates 100 percent of the time.

In this case, although the Applicant has stated that providing baseload power is, in fact, one of the purposes of this plant, we have to remember that this company has zero backup power capacity. They don't own any other power plants. So when this plant is down for repairs, down for refueling, and all

plants are down for repairs and refueling at times, they have nothing to replace it. So that throws into some question that the concept of whether this is truly a baseload power plant in the normal sense of the word, normally, these kinds of plants are used by companies such as Constellation Energy which owns the other two reactors, the two existing reactors at Calvert Cliffs.

And when one of those reactors goes down, well, Constellation can make up for that because they own other power plants. So that the people who are buying electricity from them are, in fact, steadily receiving electricity. In this case, this company has nothing else it can sell. They don't own anything else. So if you're in a deregulated marketplace, if you're a steel company or something buying from this plant and it goes down, what happens to you?

Now in some way that's UniStar's problem. Maybe nobody will buy electricity from them because they want that assurance of 24/7/365 power and it's true, it is UniStar's problem. But in the context of this contention because the NRC is arguing that solar or wind cannot be seen as baseload power, we have to argue two points. First, as we stated, a properly managed grid, particularly when combined with other

measures, other types of renewables like biogas with energy efficiency measures as Maryland state law also has, solar and wind can provide the functional equivalent of baseload power which is steady, reliable electricity 24/7 and 365. And second, if Calvert Cliffs 3 is not really a baseload power provider in the traditional sense, then why is the NRC holding solar and wind power to this supposedly higher standard?

So I don't want to take up any more time, but to sum up, there's vastly more feasible solar and wind power potential for Maryland than the NRC's Environmental Impact Statement assumes. And this means that the Environmental Impact Statement has made inaccurate conclusion about the environmental impacts of the likely combination of alternatives to Calvert Cliffs 3 and thus to an inaccurate finding that Calvert Cliffs 3 presents the least Environmental Impact Statement. Thank you.

CHAIRMAN SPRITZER: Thank you, Mr. Mariotte. We'll hear next from the NRC staff. And I believe we allotted you ten minutes. Again, you're not required to use all of that.

MR. WILSON: And we won't.

OPENING STATEMENT OF ANTHONY WILSON, ESQ.

ON BEHALF OF THE NUCLEAR REGULATORY COMMISSION

MR. WILSON: Good morning. Again, Anthony Wilson, staff counsel for the Nuclear Regulatory Commission.

This hearing is about the Final Environmental Impact Statement as prepared by the staff. That was prepared as part of the review of the Applicant's request for combined operating license. Specifically, the issue at bar today is Contention 10-C. Contention 10-C focuses on whether the FEIS discussion of combination of alternatives is inadequate or faulty.

This hearing, this contention is not about baseload power. It's not about demand side management. It's not about the region of interest or construction costs. It's about staff's Environmental Impact Statement consideration of alternatives.

As set forth in staff's direct testimony, rebuttal testimony, and exhibits, in preparing the FEIS, the staff worked in a manner that was consistent with NEPA decisions as set forth by Federal Courts and this Commission. The staff used reasonably foreseeable estimates of the foreseeable contribution of alternative resources and not theoretical maximal potential for various resources. And that is a key

point which we will bring forward.

Staff examined reasonable alternatives within the range dictated by the nature and scope of the Applicant's proposal and staff's developed Purpose and Need Statement. Staff evaluated an array of alternative sources including traditional sources such as natural gas and involving resources such as wind, solar, and biofuels. Staff also evaluated combinations of energy alternatives.

Staff analyzed these alternatives as they exist or as they are likely to exist. After conducting a careful review, staff concluded that none of the proposed alternatives or combinations of alternatives would be environmentally preferable to the proposed action. In reaching this conclusion, staff was bounded by several important Commission and Federal Court decisions on NEPA which limits staff's review and considerations of alternatives.

Specifically, the Vermont Yankee decision established that NEPA does not require detailed discussion of alternatives being remote and speculative or whose effects cannot be readily ascertained. And what is considered remote and speculative is something that is decided by the Agency in light of the facts available to it at that time.

In the Headwaters case versus the Bureau of Land Management that decision established an agency's consideration of alternatives is sufficient if it considers an appropriate range of alternatives even if it does not consider every available alternative. Then we point to the Carolina Environmental Study Group which held that decisions on alternatives may deal with circumstances as they exist and are likely to exist.

Now there's a role here for the consideration of the Applicant's needs and goals. Staff is not free to simply ignore the Applicant's request. In a Commission decision in Private Fuel Storage, in considering alternatives under NEPA, an agency must take into account the needs and goals of parties involved in the application. And in a recent Commission decision in USBC, it said that in considering alternatives, the Commission has held that it is appropriate to consider the stated purpose and means of the project.

Taking all that guidance into account, staff went through it and carefully evaluated, as we said, these alternatives and combination of alternatives and staff concluded none were preferable to the proposed action. Thank you.

CHAIRMAN SPRITZER: You're welcome. And we'll now hear from the Applicant.

OPENING STATEMENT OF TYSON SMITH, ESQ.

ON BEHALF OF THE APPLICANT, UNISTAR NUCLEAR ENERGY

MR. SMITH: Good morning. As you heard from the Intervenors and from the NRC staff, Contention 10-C challenges one small piece of the FEIS for Calvert Cliffs 3, specifically the portion that deals with the combination of energy alternatives. As you'll hear from UniStar's expert witnesses and those from the NRC staff, and as you read in their prefiled testimony, the combination used in the FEIS is based on the contributions of wind and solar power in conjunction with natural gas and other renewables that can reasonable be expected to satisfy the purpose and need for Calvert Cliffs.

The FEIS does not understate the contribution of wind and solar, nor does it overstate the need for natural gas supplement.

Now at the outset, the purpose of the project is to produce approximately 1600 megawatts of baseload power in Maryland. UniStar has already received a Certificate of Public Convenience and Necessity from the Maryland Public Service Commission and the Maryland PSC determined that there is a need

for the baseload power from Calvert Cliffs in Maryland. And also that Calvert Cliffs is a positive effect on the reliability and stability of the electricity system in Maryland. That is not in dispute as part of Contention 10-C.

As required by NEPA, the NRC staff considered a range of energy alternatives that could satisfy that need for the baseload power that was identified to state appropriately taking into account technological availability, the regulatory and economic environment for renewable development and the time period of interest.

UniStar's expert witnesses concur with the NRC staff's assessment of those energy alternatives. Based on the Maryland Renewable Portfolio Standard, the Maryland Longterm Electricity Report, Department of Energy projections, and information on current and planned renewable projects in Maryland, UniStar's expert witnesses concluded that the combination alternative reflects a realistic assessment of the technologically feasible and economically viable contribution of wind and solar to Maryland's energy mix over the 10 to 15 years.

In contrast, the Intervenors' witness takes an overly simplistic view of the potential

contribution of wind and solar generation, at least within the context of NEPA. It does not account for the commercial, the technical, or even the practical limitations associated with development of these resources. For instance, the Intervenors' witness discusses theoretical maximums rather than what is realistic. It is not any more possible to cover Maryland's solar panels than it is to put wind turbines on every ridge top. The Intervenors contend that there is tremendous potential for offshore wind, but in fact, there has been zero concrete progress towards converting that potential into reality.

Likewise, even considering further decreases in the cost of solar, solar development is contingent on the Maryland renewable portfolio standard and other incentives. The Intervenors incorrectly state that the FEIS is assuming that the Maryland state law will fail or not be implemented. That law is specifically addressed in the NRC staff and UniStar expert testimony.

The Intervenors also failed to grapple with the need for energy storage to support renewables as baseload power and there's no evidence or testimony that would undermine the overall conclusion that none of the energy alternatives are environmentally

preferable to Calvert Cliffs 3.

The Intervenors' testimony and exhibits simply do not call into question the reasonableness of the combination alternative used in the FEIS. The NRC staff, as supported by UniStar's experts, has met its obligation to use reasonable forecasts and they have come to grips with all important environmental considerations. The NRC staff even performed a sensitivity analysis or bounding analysis to provide further support for the robustness of their conclusions.

But regardless of the exact mix of renewables used in the combination alternative, it's important to keep the big picture in mind. None of the energy alternatives are environmentally preferable to the proposed action. Nuclear power has the lowest direct impact of any energy source on the environment. That includes impacts on land use, on air emissions, water, and on ecological resources. And that's because it does not emit carbon dioxide or other harmful gases. It isolates its waste from the environment and because it requires less area to produce the same amount of electricity when compared to other sources. In short, nuclear has a smaller footprint and less emissions than the alternatives.

In the end, the hypothetical combination of energy alternatives used in the FEIS which includes a very large contribution of wind and solar in conjunction with energy storage and supplemented by natural gas satisfies the need for baseload power. As confirmed by UniStar's expert witnesses, the combination alternative is based on a realistic assessment of technological availability and commercial viability over the period of interest. And the combination alternative is not environmentally preferable to Calvert Cliffs 3 even taking into accounts some uncertainty regarding the precise combination used in the FEIS.

As a result, the FEIS satisfies NEPA and Contention 10-C should be resolved in favor of UniStar and the NRC staff. Thank you.

CHAIRMAN SPRITZER: Thank you. Does the State of Maryland which to make any opening remarks?

MR. BOLEA: Thank you, Your Honor. The State does not have an opening remark other than to say we appreciate the opportunity to participate today.

CHAIRMAN SPRITZER: All right. We're glad to have you.

All right, the next matter will be to

swear the witnesses that are here. Let me ask, is Mr. Sklar here?

MR. MARIOTTE: No, our staff person is still trying to contact him.

CHAIRMAN SPRITZER: All right. Quick conference.

(Pause.)

CHAIRMAN SPRITZER: All right, I think we'll proceed with the staff witnesses. Let me just ask staff counsel in the event Mr. Sklar does appear, he testifies after your witnesses are finished.

Will your witnesses still be available assuming we're talking about today and not tomorrow?

MR. WILSON: Yes, Your Honor. Our witnesses will be available both today and tomorrow. Your Honor, our only concern to ensure that the Joint Intervenors' witness is scheduled to appear at this proceeding rather than going forward and having that witness not appear at all.

CHAIRMAN SPRITZER: Well, the only thing that seems logical to me at this point is to proceed now with your witnesses. If we get to a point where we're done with your witnesses and there's no Intervenors' witness, that is Mr. Sklar, we may be in a position to having to reevaluate. Is that an

acceptable approach to everyone? I don't see any other alternative right now.

MR. MARIOTTE: Yes, Your Honor. We are still trying to reach him.

CHAIRMAN SPRITZER: All right.

MR. MARIOTTE: Have not been successful.

CHAIRMAN SPRITZER: All right, for the witnesses that are here, I think it would be simplest if we just swore all of you in at once and I'll swear in Mr. Sklar in if we see him.

Can the witnesses who are going to testify for the staff and for UniStar please rise? I'm going to read you the witness oath. Please answer yes or no, affirmatively, nods of the head, and you can do this collectively.

Do you swear or affirm that the testimony you are going to give in this proceeding is the truth, the whole truth, and nothing but the truth?

(The witnesses were sworn.)

CHAIRMAN SPRITZER: Very good. Why don't we proceed then with the staff witnesses. We'll get started with you and we'll take a break in about 20 minutes or so.

(Pause.)

Does staff counsel wish to introduce your

witnesses?

MR. WILSON: Yes, Your Honor. At this time appearing for the staff of the Nuclear Regulatory Commission, we have Mr. Andy Kugler and Ms. Katherine Cort.

CHAIRMAN SPRITZER: Good morning. I think in asking questions we'll direct questions to you, generally. Both of you may respond to the same question or one of you, whatever you consider most appropriate.

I think your qualifications were generally covered in your prefiled testimony. I guess the only question I for both of you, do either of you have professional experience evaluating the technical feasibility of wind power or providing a required amount of electricity other than your work on this case?

MR. KUGLER: Well, Your Honor, I've worked on evaluations for several of the applications in front of the Commission, so it's not limited to just this case. I've worked on energy alternatives for -- I'm not sure of the number, six or seven of the applications that we have before us.

CHAIRMAN SPRITZER: And are those Final Environmental Impact Statements that you were working

on where you were evaluating alternatives?

MR. KUGLER: Yes, Your Honor. Some were final, some are still in draft.

CHAIRMAN SPRITZER: Okay.

MS. CORT: I have also worked on a number of applications, relicensing, and new licenses related to alternatives. In addition, I have some experience supporting the Energy Efficiency Renewable Energy Office of the Department of Energy on some of their small wind projects, assessing the costs and viability.

CHAIRMAN SPRITZER: Okay. At this time let me ask counsel whether anyone has any objections to the staff witnesses' qualifications, both of them, to provide the expert opinion testimony that is contained in their prefiled testimony?

MR. MARIOTTE: We have no objections.

CHAIRMAN SPRITZER: And I take the staff has no objection either?

MR. SMITH: We have no objection, Your Honor.

CHAIRMAN SPRITZER: Very good. Well, let me ask again by asking you a question that seems to be raised frequently. What is your understanding of baseload power, what does that mean?

MR. KUGLER: Your Honor, our understanding is baseload power is power that is provided on a fairly steady basis. We say basically a power, but that may not actually be the term, but a baseload power plant is a plant that can generate electricity steadily over extended periods of time.

In our testimony, we talked about a couple of references, one from the Department of Energy where it defined baseload in terms of typically fairly large steam electric plants. And in addition, from the renewable energy world we found a source that talked about it in terms of capacity factors. And typically, it said capacity factors in excess of 75 percent, although in excess of 90 percent would be better; and the capacity being defined as the average output of the plant versus what its theoretical capacity would be, if it was running 100 percent of the time.

CHAIRMAN SPRITZER: When you were preparing the Calvert Cliffs FEIS, did you have a particular capacity factor in mind for what Unit 3 would produce?

MR. KUGLER: Well, we did look at nuclear plants in general and typically in this country, capacity factors are around 90 percent or better. The plant itself, we don't have a specific number in mind

for Calvert Cliffs Unit 3, but we consider that it is designed to operate in that manner, to operate steadily for extended periods of time at full power.

CHAIRMAN SPRITZER: Can we bring up Applicant's Exhibit 10, APL000010? And we'll start with page 1.

(Pause.)

CHAIRMAN SPRITZER: Are you able to see the exhibit?

MR. KUGLER: Yes, Your Honor. We can see it here.

CHAIRMAN SPRITZER: This states -- it's a little further down, I think it's the -- yes, third paragraph on page 1. Yes, I think we got that. The paragraph that begins "While Maryland will soon be generating land-based wind power" -- see that?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: The last sentence says "Offshore wind power holds much promise for the Mid-Atlantic and Northeast States including Maryland because it is an abundant resource proximate to electric load centers." I realize this is not a statement about any specific amount of power at any specific time, but you generally agree with this statement or not?

MR. KUGLER: Yes, Your Honor. I would agree. There is certainly offshore wind potential for Maryland.

CHAIRMAN SPRITZER: What about the statement in the same paragraph that "Offshore wind is poised to take off."

MR. KUGLER: Well, in general, regarding the statement itself, regardless of the location. I'm not sure I would use the word "poised." It is certainly an alternative that is possible. It's something that could be built.

At this time as DOE has indicated in some of its reports, there are still a number of barriers to building offshore wind power in this country. Power companies are trying to work through those barriers. Cape Wind appears to be the first project that's likely to actually be built, but it has been a very long process getting there. They've been about ten years in licensing and they're really not quite out of the woods yet. But they are pretty close to the point where they could build. I believe they're dealing with legal challenges to the permits that they currently have.

But in terms of offshore Maryland, right now there really are no proposals to build offshore

wind in Maryland. The one proposal that had been aired by NRG, they have now backed away from at this time, but could it be done at some point in the future? It's possible. Right now, there's really nothing on the horizon that we can see for certain.

In our process, we look to see what the good sources such as the Department of Energy or the State of Maryland what they think is likely to happen. And in looking at that, the Department of Energy currently predicts about 200 megawatts of offshore wind power somewhere in the Mid-Atlantic, somewhere within the next decade. It's not clear whether it would be at Maryland or not. It could be somewhere else in the Mid-Atlantic, but that's a relatively small contribution and less than what we assume for the total contribution of wind power being built in this period.

CHAIRMAN SPRITZER: The first sentence in the second paragraph beginning -- it says "Although no offshore wind turbines have been installed in the Americas" -- I take it that means North and South America -- "offshore wind power is a proven technology with more than 15 years of operating experience in Europe." Do you agree with that?

MR. KUGLER: Yes, Your Honor. That's

correct.

CHAIRMAN SPRITZER: The operating experience in Europe, do you know who in Europe -- what do you call them, wind farms. Are they operated by private companies that sell to a private market or by government-controlled utilities or do you know?

MR. KUGLER: Honestly, I haven't looked at it. I believe at least in the one case I do recall looking at a proposed project that's not been built yet. It's a private company. I'm not sure of the extent of government supports in Europe. It probably varies from one country to another. But there are several places where they have wind farms in place.

CHAIRMAN SPRITZER: Do you have any knowledge whether the technology that exists in Europe, whether it's economically competitive with other sources of power, that is, can they produce power at a price that is competitive with other sources?

MR. KUGLER: I've not studied Europe, Europe's specific situation. What I can tell you is that the cost of offshore wind is typically viewed as being twice what it would be for onshore wind and in the United States onshore wind is marginally competitive in some places and fairly well competitive

in other places. It depends on the resource, the wind resource in a given location.

CHAIRMAN SPRITZER: What you said was marginally competitive, onshore or off?

MR. KUGLER: Onshore. So typically offshore is going to be a fair bit more expensive than that. The basic situation that happened with the Delaware project for NRG, they were looking to get financing. They did have a power purchase agreement, but only for a portion of the power from that wind farm. They did not have a power purchase agreement for the full output. But in that situation they were not able to get the financing that they needed to proceed. I think that is some indicator that financially, investors looking at it did not feel that it was going to be a good investment for them.

CHAIRMAN SPRITZER: Well, Intervenors in their opening statement raised the point that financing is also a problem for nuclear. Is that a fair statement?

MR. KUGLER: I think that probably is a fair statement. Yes, sir.

CHAIRMAN SPRITZER: That would include Calvert Cliffs Unit 3?

MR. KUGLER: I would assume so, sir.

CHAIRMAN SPRITZER: All right. My understanding at least from earlier proceedings in this case was that they were seeking -- what is it called -- a loan guarantee from the Department of Energy. Do you know anything about that?

MR. KUGLER: I'm aware of it. I don't really know any of the details.

CHAIRMAN SPRITZER: Ms. Cort, do you have anything to add on these points?

MS. CORT: No, I have nothing to add.

JUDGE ARNOLD: You mentioned 15 years of experience with offshore wind in Europe. Does that give them enough information to determine things like longevity of an offshore wind turbine and the type of maintenance costs they may incur later in life?

MR. KUGLER: I don't know that -- I'm not sure I could characterize it accurately. I believe they have certainly gotten information on the maintenance up to this point and how it proceeds. Certainly, offshore wind turbines present special challenges for maintenance purposes that onshore wind turbines don't.

So they have information on how much it costs to maintain, but whether what the life spans will be, I don't know that they've really proven it

out because I believe they're built to last longer than 15 years. So none of them will have reached their theoretical end of life yet. Whether they operate beyond that or not, I don't know that they have enough information yet.

CHAIRMAN SPRITZER: Can we move to page 19 of this document? There's a table that appears here, refers among other things to power generation potential by at a depth of I believe 0 to 35 meters. Would you agree that there is existing proven offshore wind power technology for use in waters of that depth, 0 to 35 meters?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: What about beyond 35 meters, the next level depth they talk about is 35 to 50 meters.

MR. KUGLER: I believe in Europe there are at least some turbines installed in waters that might be in that range. I'm not certain of the depths of all the installations in Europe. I know they've been working on some installations that could go as deep as 100 meters, but I'm not sure any are installed yet. But in the 35 to 50 meter, I'm not certain what depths are all set at.

CHAIRMAN SPRITZER: Maybe I should make

this general statement, we don't want you to speculate here. I don't know or I'm not sure of the answer is perfectly acceptable.

Now this table provides various figures for offshore wind power generation potential by water depth. Looking at the 0 to 35 meter depth, it states -- again, with the understanding this is simply potential and not something that they are predicting -- will be developed with any particular finding at any particular time, a potential of 2,925 wind turbines if I'm interpreting that correctly. Do you read the table the same way?

MR. KUGLER: Yes, I do, Your Honor.

CHAIRMAN SPRITZER: Do you dispute that figure as being a reasonable approximation?

MR. KUGLER: I'm trying to recall. The Department of Energy did its own study looking at each state's wind potential. I think actually in our testimony, we may have given a number if you could give me just a moment.

CHAIRMAN SPRITZER: Sure, take your time.

(Pause.)

MR. KUGLER: On page 27 of our testimony in our answer 33, we talk about that report which is NRC Exhibit 24.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: And in that exhibit on page -- let's see page 60 to 63, there's a table that provides data for the states and for Maryland, it actually attributes -- now this is out to all the depths about 54,000 megawatts. So the table -- I'm sorry, he's going to get that one.

(Pause.)

I think you have to go a little further up for Maryland.

(Pause.)

CHAIRMAN SPRITZER: Just so the record is clear, the exhibit you're looking at now is Exhibit --

MR. KUGLER: Exhibit NRC 24.

CHAIRMAN SPRITZER: Okay, go ahead.

MR. KUGLER: If you could scroll to Maryland. Okay. So the far right-hand side gives the totals and on the left side or -- I'm sorry. If you look at the center of the table it talks about capacities at different depths or different distances from shore. It's actually a combination of those two.

In the 0 to 30 meter range, I'd have to -- we have to add the numbers up, but it looks like a little bit over 10 gigawatts or 10,000 megawatts. So the numbers are not significantly different between

this study and the study that was being referenced. They're in the same ballpark.

But certainly, it's a substantial number when you look at the pure potential in excess of -- let's say at least in excess of 10 gigawatts.

CHAIRMAN SPRITZER: Now returning, if we could go to -- and the two exhibits were -- just so we're clear is Table 3 on APL-10 and what is this -- Table --

MR. KUGLER: 4-3.

CHAIRMAN SPRITZER: NRC 24. Okay. Now returning if we could to APL-10, again on page 19. That's the same page we were on. There we go. It's got two figures or two columns, one for nameplate capacity and one for -- the second for -- the next one over, for average output. Nameplate capacity, is that the same as installed capacity?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: What does that represent?

MR. KUGLER: That would be if you install a 5 megawatt turbine, it's a 5 megawatt capacity. That was designed as its maximum output.

CHAIRMAN SPRITZER: Okay, and when you say nameplate capacity, of 14,625 megawatts, is that a

rate or something else?

MR. KUGLER: It's the maximum output. If you build turbines in every location you possibly could and you put them all out there, I'm not sure what size turbines they were assuming, but if you build all the turbines out there you could, what they're saying is the total capacity at full power of all those turbines combined would be over 14,000 megawatts.

CHAIRMAN SPRITZER: And the next figure, or the next column over gives us a figure for average output. I take it that's also in megawatts?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Do you have an understanding of what this table is referring to when it talks about average output?

MR. KUGLER: Yes, Your Honor. This would be on average how much you would actually get out. So if you've installed over 14,000 megawatts of capacity, which is on your absolute best day, theoretically, that's the most you would get. But on average what your output would be is a little bit under 5,000 megawatts, 4,982 megawatts. So that's your average output. And so when you looked at capacity factors we talked about earlier, you would take that 4,982

megawatts average output, divide it by the 14,625 megawatts of installed capacity and that would be your capacity factor.

So round numbers, it's probably about 34 percent is what that looks like, 35 percent, in that range. It may be -- well, I don't want to speculate as to how they came up with their numbers, but that's what they believe they would be able to get out of it.

ADMIN. JUDGE SAGER: Pardon. I wanted to ask a quick question of clarification. So in the staff documents, they use megawatts with a little e. Is that what we're referring to as average?

MR. KUGLER: Actually, not necessarily. We use megawatt e just meaning megawatts electric. So you could have a capacity of megawatts electric and you could also have an actual average output. I think typically and hopefully we were clear in our testimony when we were talking capacity and when we were talking average output.

CHAIRMAN SPRITZER: Okay, now is there any relationship between the concept of average output as you define the term and baseload power? Are they in any way related?

MR. KUGLER: I would say there is some relationship. A plant that typically is used to

provide baseload power is a plant whose average output is fairly close to its rated output. So for example, average for nuclear power plants in this country is a little bit over 90 percent capacity factor. So if you have a 1,000 megawatt plant, it doesn't run all the time at 100 percent capacity. But it's average output over time is about 900 megawatts.

So when we look at this, if you look at say wind turbines, right now typical onshore installations if you've got a good location, you might be talking around 34 percent capacity factor. So if you have 1,000 megawatts of wind turbines installed which would be a pretty big wind farm, you would get on average 340 megawatts out of it.

Offshore wind usually you can get a better capacity factor because the winds tend to be steadier offshore, but typically we'd be looking more in the range of 40 percent on average, depending on location. So there if you install 1,000 megawatts offshore, you would get on average about 400 megawatts out.

CHAIRMAN SPRITZER: Okay, now if I took this 4,982 megawatt figure and multiplied it by the capacity factor for offshore wind, let's say 40 percent, does that give me a figure in baseload power or not?

MR. KUGLER: Actually, the number 4,982 is the average output.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: Now one of the challenges for sources like wind and solar is they are intermittent in nature. They're not controllable by the dispatcher in the same way other plants typically are. So if the dispatcher needs power and there's no wind at that moment, he can't get the wind power. So that creates a challenge for them. But what this number indicates is that on average over the course of time this is how much energy you could get out of that 14,600 megawatts of installed capacity. You would get around a little under 5,000 average output, but some days you might be getting the 14,000. Other days you may be getting zero. So it's going to vary depending on the availability of wind at that location.

CHAIRMAN SPRITZER: So the 4,982 average output already reflects multiplying the nameplate capacity by the estimated --

MR. KUGLER: Capacity factor. Yes, Your Honor.

CHAIRMAN SPRITZER: Again, I'm trying to get clear in my own mind, you understand I'm not an electrical engineer or a nuclear engineer, what

connection there is, if any, between this 4,982 and quote baseload power? If I was looking at this table, could I say let's assume hypothetically that 2,925 wind turbines were installed at a depth of 0 to 35 meters, with this nameplate capacity of 14,625, that I could be confident of having 4,982 megawatts of baseload power from such an installation?

MR. KUGLER: No, that wouldn't be correct.

CHAIRMAN SPRITZER: Okay, explain why not?

MR. KUGLER: Okay, I'll explain why. Again, what that is is an average output. Now you've got over 14,000 megawatts installed. So on a really good day, you're going to have over 14,000 megawatts of output from those wind turbines. You may not be able to use all that. One of the challenges, for instance, in West Texas, there's a lot of wind farms in West Texas, great output, they're a good wind. They can't always get the power where they need it because the power's needs is in the eastern part of the state and the transmission system often limits them. So there are times when they actually have to reduce the output of the wind turbines below what they could be getting out of them because they simply don't have the transmission capacity.

Other times when they need the power, they

may not be getting any from the wind turbines if the wind doesn't happen to be blowing at that time.

Now we talk about in both the EIS and in the testimony about there are ways you can try and smooth that output and one possibility is compressed air energy storage. What would you do there is when you've got a lot of wind blowing and you've got a lot of output, but you don't need it all, you would store energy and then when you needed it and the wind wasn't blowing, you could recover that energy and you could basically smooth the output. So although wind turbines by themselves don't work well for baseload power, coupling it with energy storage would allow it to act a lot more like baseload power.

CHAIRMAN SPRITZER: If I'm understanding what you're telling me, the 4,982 average output could have a lot of variability built into it?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: On average I drink two cups of coffee a day, but one day I might drink one, the next day five, the next day two, and so forth.

MR. KUGLER: Right.

CHAIRMAN SPRITZER: So the average output figure doesn't address, doesn't incorporate the variability. Is that at least part of the problem?

MR. KUGLER: It doesn't really show you how much it varies, that's correct. You can't really see it in that number, although you get a sense of it from the total installed capacity and the large difference between the installed capacity and the average output.

CHAIRMAN SPRITZER: Is there some way that engineers use to measure the variability as well as the average? I mean in statistics you have a mean and then you have a standard deviation, something like that. Do you use equivalent-type data in evaluating electric systems, electric supply systems?

MR. KUGLER: I have not done anything of that nature. I suspect they do. I know in some of the studies that I've looked at they do talk about studying how they expect the wind to vary and how well can they forecast the variability of the wind, what can they expect out of a wind farm and then how do they accommodate that in the grid?

This is probably one of the greatest challenges facing the grid operators right now because around the country we're trying to incorporate renewables. But incorporating wind and solar presents some real challenges to the grid operators in how they compensate for this variability over which they really

have no control.

There's always built-in reserve in the grid. You have to have reserve margins in order to accommodate a power plant going down suddenly. So you have to have something behind it that you can start up. It doesn't necessarily belong to the company whose power plants shut down. It may belong to some other company, but the grids are all interconnected and there are grid operators who will order resources to fill in for unexpected occurrences or for expected occurrences. If a plant is planning to shut down, then the grid operators will lay out ahead, all right, how am I going to compensate for that? What am I going to start up in its place? So there has to be margin. A typical reserve margin may be 15 or 17 percent of the grid.

CHAIRMAN SPRITZER: Now you mentioned compressed air storage is one way of dealing with the variability of wind. Would the mechanism you just described also be a way of dealing with the variability problem?

MR. KUGLER: It's another way you could do it. It is more difficult for the grid operators I think to deal with. It depends on how much wind you're try to integrate into the grid. If you're only

integrating a small amount, like right now in Western Maryland there's 120 megawatts of wind farms. One hundred twenty megawatts for the size grid we're talking about in ReliabilityFirst East area, they can probably accommodate that without too much of a challenge. They have enough small reserve plants that can come up quickly or go down quickly that they can probably accommodate that. It becomes more of a challenge the more wind or the more solar you're trying to integrate into the grid because the bigger those contributions become, the more you have to try and compensate for.

CHAIRMAN SPRITZER: Now I believe the figure you used in the FEIS for Calvert Cliffs was in the neighborhood of 300 or 350 installed capacity. Do you remember the precise number?

MR. KUGLER: For wind we were talking 100 megawatts on average and so we said 250 to 300 megawatts installed capacity.

CHAIRMAN SPRITZER: And that was to all be onshore wind, I think.

MR. KUGLER: Actually, we didn't specify. It could have been -- and actually, the range, the 250 would really be offshore because that's about a 40 percent capacity factor. And the 300 was -- if you

were building onshore because that has a lower capacity factor. You need more installed capacity.

CHAIRMAN SPRITZER: So in the FEIS, you didn't differentiate between -- your figure did not focus on onshore versus offshore. It was total wind --

MR. KUGLER: No, Your Honor.

CHAIRMAN SPRITZER: Total wind capacity.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Now for a supply on the order of -- an installed capacity on the order of 300 megawatts, would this reserve approach that you've been describing be a feasible approach for dealing with the variability?

MR. KUGLER: The grid operator would have to look at that. I can't tell you for certain. When a new plant of any sort is going to be connected to the grid, the owner has to work with the grid operator and go through a process in which they will look at what they expect the output of the plant to be, how it's going to be integrated into the grid, how loss of plant will be compensated for and you have to look at a number of different aspects beyond just the amount of power. They have to look at where the power is entering the grid.

Some places you have a lot of congestion and it may be hard to get power in there if a plant goes down. Other places it wouldn't be as difficult. So they look at all of those factors in determining whether to approve adding a plant to a given location in the grid.

So in this case, if such wind power were proposed, the grid operator would work through how they would compensate for it. Compressed air energy storage is one way to do it which will give you the smoother output. Compressed air energy storage is environmentally better than the typical methods that the power company might use to compensate because you're using the air pressure from the compressed air energy storage as part of your energy to drive a generator. Now there's also combustion of gas in the typical case facilities, the two that exist today.

If you instead said well, I'm not going to do CAES. We've talked to the grid operator. They're going to cover us probably with gas turbines because they react quickly. Then there will be a little bit more of an environmental impact because you'll have more gas burned to compensate for the lost power than you would if you had CAES. It's not a large difference. So it probably could be done if it can be

worked out with the grid operator.

CHAIRMAN SPRITZER: Now with respect to the combined alternative that you looked at for Calvert Cliffs Unit 3, assuming you could have, let's assume hypothetically that you could have a total of installed capacity for wind of 1600 megawatts electric, equivalent to Calvert Cliffs. I'm not saying that's true. I'm just saying let's assume that hypothetically.

MR. KUGLER: Okay.

CHAIRMAN SPRITZER: Could you use a natural gas plant cycling up and down as the need arose to compensate for the variability in the wind production?

MR. KUGLER: You could do that. You would need a large natural gas plant to do that. And it becomes rather expensive because in essence what you're going to do is you're going to build two power plants. You're going to build a wind power plant of 1600 megawatts and a gas power plant of 1600 megawatts. And the wind plant will operate at let's say it's offshore 40 percent of its capacity which is all you're going to get out of it and then the gas power plant will run at about 60 percent capacity because it's only going to be supplying power when you

compensate for the wind.

So it gets a little expensive to do it that way.

CHAIRMAN SPRITZER: You're in effect building double the capacity you need.

MR. KUGLER: When you start having large penetrations of these renewables, that's in essence what you end up having to do in order to compensate. It's not really quite as simple as that because again, you have these large grids that are integrated with a lot of different sources tied to it. So when you go to that grid operator and say I'm going to build 1600 megawatts of wind power here, they may be able to compensate for a part of it with existing reserves, but you would almost certainly still have to build something to compensate for some of that power because it's just such a large component that's going to be very variable.

CHAIRMAN SPRITZER: In Europe where they told us they use wind, offshore wind farms, do they combine? Are there any systems there that you know of that combine offshore wind with a natural gas plant in the manner we've just been talking about?

MR. KUGLER: I actually don't have any information on exactly how they compensate for their

wind over there. They obviously have come up with some ways to integrated it into the grid, but I'm not sure if they've built gas plants or something else. The reason I tend to look at gas plants, gas plants can respond quickly. So if you have a fairly sudden change in your wind power output, the gas plants are able to come up quickly to respond to that. Coal plants tend to be fairly slow coming up. Nuclear plants are fairly slow coming up. Hydropower plants can also respond quickly. So if you have hydropower available, that's another option.

CHAIRMAN SPRITZER: Now the FEIS for Calvert Cliffs Unit 3, again when you're looking at combined alternative, as I understand it, you assumed a baseload contribution, baseload, not installed capacity from the various renewables, wind, solar, and I think there were several others, also for conversation and demand-side management. The total of all those added together expressed in terms of baseload power was 400 megawatts electric?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: And you assumed a continuously operating gas plant producing the remaining 1200 megawatts electric that you would need to get up to the total baseload provided by Calvert

Cliffs Unit 3.

MR. KUGLER: Yes, that's correct.

CHAIRMAN SPRITZER: Now did you look at the possibility of increasing the contribution from the total renewable sources including wind and solar above 400 and using that to reduce the amount of time, if that's the appropriate phrase, that the gas plant would have to operate?

MR. KUGLER: Well, let me back up a little bit and talk about how we approach this. The basic approach following our guidance is to look for various alternatives that individually could replace the proposed project and possible combinations of alternatives.

So the way we approached the renewables was looking at reports from the Department of Energy and reports from Maryland, we developed what we thought were reasonable contributions from wind, solar, biomass, hydro, and we added everything together and we came up with that 400. And then we replaced the balance with the 1200 natural gas plant.

We believe that that's a reasonable combination of alternatives. Actual renewables may be less than 400 or it could be more, but we think 400 is in about the right range. We did in the Environmental

Impact Statement and in response to comments we received on the draft, we did include a scenario where we quadrupled the amount of wind power, so it would have been 400 megawatts baseload equivalent of wind power, equivalent to 1,000 to 1,200 megawatts installed capacity, depending on where it was built.

Now we didn't consider that to be an actual alternative because we don't foresee that as actually happening in the time frame we're looking at, but we felt it would be useful to decision makers to see well, what would that look like?

When we included that scenario, it reduces the size of a natural gas plant down to 900 megawatts which is still a pretty big natural gas plant. You now increase the impacts from the wind farms. If they're built on shore, you increase the land area that has to be cleared for these wind farms. If you do it offshore, you're taking up a very large area. I believe in our testimony, we spoke to what it would look like and I think it was 55 square miles that you would cover with wind turbines offshore somewhere. So you increase those impacts. You marginally decrease the impacts of a natural gas plant, but it's the emissions of the natural gas plant are still pretty significant.

CHAIRMAN SPRITZER: Did you calculate how much the emissions from the natural gas plant would go down under the scenario you just mentioned?

MR. KUGLER: We didn't do it in the EIS. We recognize it would be roughly three quarters, so we knew what it would be. We didn't actually put that calculation into the Environmental Impact Statement.

CHAIRMAN SPRITZER: What would be three quarters?

MR. KUGLER: I'm sorry, the emissions would be roughly -- in going from a 1,200 megawatt gas plant down to a 900 megawatt gas plant, you would be at roughly three quarters of the emissions of what we have calculated for the combination alternatives. But it's still very significant. I believe the number, I believe it's in our testimony, but it's over three million tons per year for CO_2 and various other emissions as well. CO_2 is obviously a pretty significant one right now.

CHAIRMAN SPRITZER: Now if -- I would take it that if the natural gas plant were operating in the scenario you just described, the natural gas plant is still operating full time, 100 percent of the time.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: And just applying a

lower wattage, 900 instead of 1,200. Is that correct?

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: If we have a 900 megawatt natural gas plant and it's cycling up and down as needed because we have even more, hypothetically again, I'm not saying this statement is feasible. Assuming hypothetically that we had even more contribution from the renewables, would that further tend to reduce the emissions that the natural gas plant is operating intermittently rather than full time?

MR. KUGLER: Certainly if you reduce the amount of time it's running, it would reduce the emissions, but at the same time you're going to be increasing impacts from whatever you're adding, whether it be wind or solar. Those impacts continue to go up.

CHAIRMAN SPRITZER: Okay.

ADMIN. JUDGE SAGER: One quick question. Why quadruple? You picked the number quadruple for sensitivity analysis. Why not five times or ten times?

MR. KUGLER: I don't think there was a specific reason we picked that number. We felt that was going well beyond what we thought was reasonable

without getting completely ridiculous. I really don't see with what's happening right now that we could see a 1,000 megawatts of wind power in Maryland any time in -- anywhere in this timeframe. Things would have to change dramatically to drive growth like that, but we just felt that that was showing that even with this significant change beyond what we thought was reasonable, it really didn't affect the outcome because you're still going to need a big natural gas plant and you're still going to have -- you're going to have more impacts associated with that expansion of the wind farm.

CHAIRMAN SPRITZER: But when you said change the outcome, from what I've understood your testimony so far it would change in a downward direction the quantity of emissions if we just look at the number of the amount of emissions, if we just look at the number of amount of emissions.

MR. KUGLER: Yes, sir. What I'm saying is it wouldn't bring you to the point where that option would be environmentally preferable to the proposed action.

CHAIRMAN SPRITZER: Okay. I just wanted to clarify your testimony. Okay.

We're 5 of 11. Let me just ask the

Intervenors, any word about the whereabouts of Mr. Sklar?

MR. MARIOTTE: No, Your Honor.

CHAIRMAN SPRITZER: All right. This might be a good time to taken a ten minute or so break. We'll resume about 11:05.

(Whereupon the above-entitled matter went off the record at 10:55 a.m. and resumed at 11:11 a.m.)

CHAIRMAN SPRITZER: Witnesses, of course, are still under oath. You used the term during your testimony, I believe it was, time table -- time frame, I believe is the term, what time frame were you referring to?

MR. KUGLER: Well, in looking at the -- using the application as a starting point for our review, actually the environmental report and in terms of what was done for the Environmental Impact Statement, we were looking at a completion of construction at the end of 2015. In the most recent revision to the application in Part 1, UniStar indicates revised date for the completion of construction of 2017. Our testimony talks about both. But the Environmental Impact Statement was done in terms of 2015. But in writing our testimony knowing

now the 2017 date, we did consider 2017 in our considerations.

CHAIRMAN SPRITZER: All right, when in 2017?

MR. KUGLER: End of December, end of the year.

CHAIRMAN SPRITZER: But in terms of the FEIS itself, when it talks about the amount of wind power generation that was considered foreseeable, that was based on the December 2015 figure. Is that correct?

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: Do you know the construction time required to install a wind turbine at 0 to 35 meters, that's an offshore wind turbine, obviously?

MR. KUGLER: I don't know specifically the construction time. I have seen in one of the exhibits and I'll be honest, I don't recall which one. I don't think it was one of ours, but it talked about it was possible to take a project from beginning of permitting to completion of construction within a couple of years. It's possible. It doesn't necessarily always work that way. I believe maybe in one of the Intervenor exhibits, but I cannot recall

which one at this point.

CHAIRMAN SPRITZER: And that's for offshore wind or onshore?

MR. KUGLER: That was onshore.

CHAIRMAN SPRITZER: For offshore wind?

MR. KUGLER: I don't have a number for offshore.

CHAIRMAN SPRITZER: Okay. What about cost, the cost of installing a wind turbine today in 0 to 35 meters of water?

MR. KUGLER: We didn't actually get into the cost figures and I'll explain why. The way our guidance has us approach this review, the first thing we do is we look for feasible alternatives that could meet the purpose of the project. And then we compare them to the proposed action and determine whether any are environmentally preferable. If none are found to be environmentally preferable, we're done. We don't ever look at cost because the cost isn't relevant at that point. The only time we would look at cost would be if we had determined that there was an environmentally preferable alternative. We would then look at other factors as to whether there was some other reason it might not be practical as an alternative. So we really didn't get into costs when

we were evaluating these alternatives.

JUDGE ARNOLD: Along that line, do you have specific criteria that you use to decide whether or not an alternative is reasonable and needs to be evaluated in the EIS?

MR. KUGLER: We do. In the Environmental Standard Review Plan, we talk about it being commercially viable and available in the region, something that is a proven technology. I'm sure we have it in the testimony, if you give me just a moment.

JUDGE ARNOLD: Wouldn't commercially viable also include cost?

MS. CORT: Yes. I'll address that. When we are doing the review of the energy alternatives, as Mr. Kugler mentioned, we look generally at the technical feasibility and the commercial viability in a given region of interest. And certainly cost plays a role in the commercial viability of a given technology. So in a broad and general sense we look at cost, but in terms of comparing, doing a detailed cost comparison of one technology with another, that wouldn't come into play unless we were to determine that the energy alternative was environmentally preferable to the proposed action.

That said, however, when in deriving the contributions, individual contributions to the combination of energy alternatives, we relied on projections from the State of Maryland and from the Department of Energy, U.S. Department of Energy, and these analyses and projections did specifically and explicitly consider the cost of technologies. And so in relying on some of these projections we've indirectly considered the cost of various technologies.

CHAIRMAN SPRITZER: All right, let me make sure I understand. So the projections you were relying on from the Department of Energy and others, they would reflect information about the comparative cost of, for example, wind versus alternatives.

MS. CORT: That is correct.

CHAIRMAN SPRITZER: To what extent today, if you know, did the Department of Energy projections compare the cost of building a new nuclear power plant such as Calvert Cliffs Unit 3 and the cost of installing offshore wind turbines, for example?

MS. CORT: It's pretty complicated to answer that in some respects because this is all compared in a rather complex modeling system, referred to as the National Energy Modeling System. And that's

the model that produces the results to the Department of Energy's The Annual Energy Outlook. And it's the regional supplemental tables to The Annual Energy Outlook that we relied on to inform the process.

But to get back to how is cost considered, within the model, they'll look at the capital costs of installation and those are termed as overnight capital costs, but those are all moderated with considerations of investment certainty and the productivity improvements in a given industry through a series of scalers which take into consideration technical optimism and learning and contingencies in financing. So the actual costs, the effective costs that are compared are embedded in the model and so it's a little difficult to compare one to the other.

In addition to the costs, they will consider tax incentives and credits and regulation, policy factors such as renewable portfolio standards, for example.

CHAIRMAN SPRITZER: I guess what I'm trying to get at it sounds to me what DOE was doing was comparing costs in a very broad nationwide sense, looking at all kinds of different technologies. Is that a fair --

MS. CORT: No, actually, it's at a

regional basis, so all regional multipliers are applied to 22 different regions throughout the U.S. so that they have a more specific regional outlook to the costs.

CHAIRMAN SPRITZER: What region is Maryland a part of?

MS. CORT: In The Annual Energy Outlook, for the electricity capacity expansion module, they're considered the RFC East region which --

MR. KUGLER: ReliabilityFirst Corporation.

MS. CORT: East Region. That includes four states: New Jersey, Delaware, most all of Pennsylvania, and Maryland.

CHAIRMAN SPRITZER: Okay, if I was trying to do a cost comparison of offshore wind power to the cost of constructing Calvert Cliffs Unit 3, do you believe that type of information provides a reliable basis for making that very specific comparison?

MS. CORT: I believe that the projections that we relied on include and consider most of those factors, but I myself wouldn't be able to compare one cost with another and come up with my own projection.

CHAIRMAN SPRITZER: The reason I ask that is I understand we're looking at the question what would be a reasonable alternative to Calvert Cliffs

Unit 3? Let me ask just one more point of clarification on this issue. Did the staff ever do a direct side-by-side comparison of cost of Calvert Cliffs Unit 3 versus the cost of new wind turbines installed in shall offshore waters side by side?

MS. CORT: No.

MR. KUGLER: No, Your Honor. We never did that.

CHAIRMAN SPRITZER: All right. If we could go back briefly to Applicant's Exhibit 10 and it would be on page 20, Table 4. Now the top row gives us estimates of annual generation in megawatts hour per year at 0 to 35 depth. This is for Maryland offshore wind potential, gives us, I believe, the same figure we were looking at before for average output. And it's telling us, I believe, in the column labeled percentage of load that this level of output would provide 67 percent of load. Do you understand what load means or how it was used in this document?

MR. KUGLER: Yes, Your Honor. Looking at the paragraph above, it explains it a bit.

CHAIRMAN SPRITZER: Okay, all right.

MR. KUGLER: So in other words, what they're saying here, if you look at that paragraph above, they say in Maryland in 2007, the State

consumed a little over 65 million megawatt hours. That's how much energy was actually used in electricity. And theoretically, offshore wind in the 0 to 35 meter realm, again, if you fill the entire space with wind turbines, you could theoretically get a little over 43 million megawatt hours out of the wind turbines which would be roughly two-thirds of all the energy consumed in Maryland.

CHAIRMAN SPRITZER: Now understanding that this is purely a theoretical estimate, do you have any problem with that as a realistic projection?

MR. KUGLER: That's actually two different questions. I don't think it's a realistic projection, but it's probably a reasonable theoretical projection of what could be done. Again, you would have to fill the entire area with wind turbines.

CHAIRMAN SPRITZER: All right.

MR. KUGLER: And I'm trying to recall, I don't recall this report offhand, whether it considered things like shipping lanes and other areas you have to avoid. I can't recall whether this particular report did. It may have. Let's see. Yes. It looks like this report did consider that. So that was taken into consideration by the authors.

CHAIRMAN SPRITZER: Okay.

ADMIN. JUDGE SAGER: Let me jump in while Judge Spritzer is looking for other questions. It appears that you've based your analysis on the DOE report. Part of the impression that I get is that the Intervenors have based their analysis on other reports, so what makes the DOE report definitive?

MS. CORT: Well, we based our review both on analyses coming from the State of Maryland and from the Energy Information Administration Annual Energy Outlook. And the Energy Information Administration is the analytical and statistical agency within the U.S. Department of Energy that has a responsibility of independently and impartially analyzing and collecting energy information for the U.S. and for the purposes of policy making.

We find that to be an authoritative and impartial objective source of information particularly for these projections looking into the future. And with the State of Maryland as well, information from the Maryland Public Service Commission, they being in charge of ensuring that their customers have sufficient and reliable power and part of that is to conduct these analyses on current and expected generation capacity and we found that to be, again, an authoritative source.

ADMIN. JUDGE SAGER: Would you say these are standard sources for this type of analysis?

MS. CORT: Yes.

MR. KUGLER: I would like to add something else in regard to that, if I could. There's a fundamental difference between looking at what the potential is and what is likely to happen. Our guidance is for us to look at what's reasonable foreseeable, what we think will happen in the region.

The report here, and DOE has a similar report that we refer to where they looked at what is the potential and the potential is quite large. Even in the DOE report, the potential is over 10 gigawatts of installed capacity. But what the Energy Information Administration does in these projections in The Annual Energy Outlook is they look into the future as best they can and say based on all the factors we're looking at in the modeling that Ms. Cort talked about, this is what we see coming. This is what we think will actually happen in terms of what will be built versus what could theoretically be done based on the total potential. And we think that's a very important distinction. It takes us to what our guidance tells us to do. If we base everything just on what the potential is, I don't know how you would

approach it because there's big potential for lots of different sources, but how likely are they actually to be built? That's what we try and get at through the DOE reports and the State reports.

CHAIRMAN SPRITZER: One point I found somewhat -- your direct testimony and your testimony here today, you continuously use the term reasonably foreseeable. And you say that's derived from your guidance, correct?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: One thing I'm trying to understand is how does the concept of reasonable foreseeability, as you use it, relate to the question whether a particular alternative to Calvert Cliffs Unit 3 is technologically feasible and commercially viable?

Were you assuming when you prepared the FEIS that if a particular amount of particular level of wind, installed wind capacity was not reasonable foreseeable according to the reports you looked at, that it was therefore not technologically feasible and commercially viable as an alternative to Calvert Cliffs Unit 3? Are they one and the same?

MR. KUGLER: I don't think they're quite one and the same. Wind power is certainly possible in

Maryland, both onshore and offshore. Commercially viable, I think at the moment offshore wind what we're seeing it's not competitive, but at some point that might change.

CHAIRMAN SPRITZER: At what point?

MR. KUGLER: Well, the economics would have to change significantly. Carbon tax, perhaps. If a carbon tax drove power companies away from coal and natural gas, perhaps. At that point, the cost of electricity would be rising in response to that and other sources of energy that currently aren't very competitive economically might become competitive. So things would have to change, I think, before offshore wind would become very competitive.

But what we're looking to do here because we're doing a NEPA analysis, so we're looking at the reasonable man-type approach. What do we think reasonably can be expected to happen in this area?

Now when you get into that if you start talking different sources, you can get any number of different answers and a lot of what we've seen in the Intervenors' information goes to discussions of here is the potential that's there and therefore that's a really big number and so we should be able to get big numbers out of that. Even if we don't harness all of

it, if you harness half of it that's a lot.

But what we're doing in looking at what DOE has written in The Energy Information Administration Reports and in the State reports, is to get a better sense of okay, what is likely to actually happen in this area and? So if you look at Department of Energy, they do their projections. And that's really what they're saying, here's what we think is likely. Could be higher, could be lower in the end, but this is what we think is likely at this point.

The State in looking at the Long Term Electricity Report which is the Applicant's Exhibit 5, they went through and did their own projections of what they think will happen just in Maryland. And both their projections and their reference case and the DOE projections in their reference case are consistent with what we have put in our Final Environmental Impact Statement. So we're not saying that more wouldn't be technically feasible. But we're saying this is what is most likely to happen.

CHAIRMAN SPRITZER: I didn't understand that you were saying that more wind was not technically feasible. I guess the focus for me is more on the question on commercial viability in deference to the argument that Mr. Mariotte raised

earlier, let me ask again about nuclear.

Is nuclear -- let me ask it this way, do you have an opinion today whether Calvert Cliffs Unit 3 is commercially viable?

MR. KUGLER: I'll be honest. I don't really get into whether it's commercially viable in my evaluation. It is the action proposed for us and so what we're doing is comparing what has been proposed to be done versus what the alternatives are. So I don't really look at whether or not it's -- well, we know it's technically feasible. We know nuclear power is something that currently exists in the State. So in terms of being commercially viable, it is at least in theory commercially viable as well. But we're not saying it will be built. We're not claiming that. But this is what's proposed.

CHAIRMAN SPRITZER: I guess the problem I'm having there is what -- if I understand your analysis correctly, the amount of wind, offshore wind, for example, that we could expect to be built is connected with the time frame that we're talking about. Are we talking about 2015, 2017, 2020, 2025?

I certainly understand that normally for purposes of doing alternatives analysis, the commercial viability of the proposed action is

ordinarily not at issue. But if we're looking at finding a reasonable timeframe for a project that at least based on some of the evidence I've seen seems to have a fair amount of uncertainty associated with it, don't we have to take that into account to define a reasonable time frame?

MR. KUGLER: Well, the approach we take in our evaluation is to work with the action that is proposed in front of us. And in this case, at the time that we prepared the Final Environmental Impact Statement, we were using the year 2015. By the time we were working on our testimony that date had been revised to 2017 and we did consider that in our testimony. So we looked out to 2017.

To go beyond that I don't think would really conform with the way our guidance is set up, but even if we wanted to do something like that, I'm not sure how we would speculate as to what date to use.

CHAIRMAN SPRITZER: All right. Can we look at this document again, APL-10, page 23, somewhere in here it refers to a 25-year power purchase agreement. There we go. The report states -- you can see the next to the last paragraph, "the Delaware Bluewater Wind Project bid which won out over

a coal bid and a natural gas bid suggests that large-scale offshore wind projects can be cost competitive with new fossil fuel generation after accounting for future fossil fuel prices and likely costs to emit carbon into the atmosphere." Do you see that statement?

MR. KUGLER: Yes. Your Honor.

CHAIRMAN SPRITZER: Apparently, this was written before the recent developments affecting the Bluewater Wind Project. But irrespective of that, you can take that into account if you want, I guess my question basically is this statement -- do you have any problem with this statement, if you think that's a reasonable conclusion?

MR. KUGLER: I'm not sure one could be drawn from the other directly. But I must admit I'm not an expert in that particular area. I'm not sure I could -- it would be somewhat speculative on my part. But I will point out a little further down at the end of that page it talks about the cost of energy from the offshore wind as 11.4 cents per kilowatt hour.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: And I believe we have our estimates for nuclear in the Environmental Impact

Statement and they would be lower than that.

CHAIRMAN SPRITZER: Do you recall what they were?

(Pause.)

MR. KUGLER: This is in Chapter 9 -- I'm sorry, Chapter 10, Table -- I believe it's 10-4. Table 10-4 in the Environmental Impact Statement on page 10-24. I don't know if he wants to try to get that up on the screen.

CHAIRMAN SPRITZER: That would be helpful.

MR. WELKIE: The exhibit number?

MR. KUGLER: It's Exhibit 3A, 3A. For some reason it isn't there.

CHAIRMAN SPRITZER: We seem to be having some problem with the technology -- wait a minute, there it is.

MR. KUGLER: Go to almost the very end, so you might just want to go to the end and move up. This is Table 10-4 and it provides data in different areas. You've got the overnight costs, the cost of operation and fuel and decommissioning. And actually, I think it's probably more clearly discussed -- you have to give me a moment. This isn't a section that I wrote.

(Pause.)

If you go to page 27 toward the top, that first paragraph, it talks about the levelized cost which includes the capital cost as ranging from 3.8 to 8.6 centers per kilowatt hour for operation costs and then to that you would have to add the fuel cost and decommissioning costs which would put you in the range of another .6 cents, so something like 4.4 to 9.2 cents per kilowatt hours is the estimated range.

Now I guess if we accept the number at 11.4 cents per kilowatt hour and I don't know the basis behind it exactly, so it's difficult for me to say for sure. It certainly is higher than the estimate for nuclear, but it's not double. So could it be done? Yes, I think it possibly could be done. But again, it will depend on the economics.

In the end, whatever gets built is going to be driven by economics. That's going to be the factor that really determines what will really happen.

CHAIRMAN SPRITZER: Okay. Could we bring up Mr. Sklar's testimony? That would be Intervenors Revised Exhibit 1, page 8.

Let's go down to the bottom of the page. He refers at the bottom to an October 2010 announcement by Google and GoodEnergies that "they have established a consortium and a $5 billion

transmission backbone to bring offshore wind in the region to the shore. Such large investments and transmission are not made to transmit small amounts of electricity."

Do you have any response to that argument, I guess you would call it?

MR. KUGLER: I guess what I would have to say is that this is an idea at this point. It's a proposed project. I don't know that it has progressed very far and at the moment with the only wind projects that were planned in the region, basically on hold indefinitely, I would be very surprised if this project moved forward. I mean they're going to want to know that they have some power to move.

CHAIRMAN SPRITZER: In other words, this may be a naive question on my part, but you don't build a transmission facility before you build the power generation facility normally.

MR. KUGLER: Generally not, unless you feel pretty certain that the power facility is going to be there.

CHAIRMAN SPRITZER: Let's assume again, hypothetically though that such a facility is built. How, if at all, would that affect the variability problem with offshore wind power?

MR. KUGLER: Well, it's rather theoretical, but what I guess I would see as the value of such a backbone would be the ability to move power up and down the coast, so if the wind is not blowing in one region, but it's blowing somewhere else, you could potentially move the power around. But for the most part, honestly, every state needs more energy.

And if you build wind turbines off the coast of New Jersey, while you could ship the power down to Maryland, I would think the people in New Jersey are probably going to want that power. So I don't know how much movement of power you would have. But my understanding of that backbone is the way it would tie in I guess you could move any power, it wouldn't necessarily have to be offshore wind. You could also move power from onshore to offshore down the backbone and back on shore. So it might have other uses beyond just moving offshore wind power onshore.

But again, I'd be surprised if we saw much progress on that until there are some solid proposals moving forward on wind projects where they're actually moving to construction.

CHAIRMAN SPRITZER: Can we bring up -- I don't really have a specific page for this, Joint

Intervenors Exhibit 12?

This is cited in Mr. Sklar's testimony. Have you had a chance to review this document?

MR. KUGLER: I did look at it briefly.

CHAIRMAN SPRITZER: Now the conclusion is sort of indicated by the colorful diagram on the cover is that there's been a crossover between solar and nuclear costs as of 2010 where as of 2010 the cost of solar power as compared to nuclear was equal and apparently this projects that trend to continue with nuclear continuing to rise and solar continuing to decline.

Do you have an opinion on the credit, if any, we should give to this study?

MR. KUGLER: Well, I think first I go back to the basic approach we take. Cost was not really a direct factor in our evaluation, so we didn't consider it in our comparison.

I suspect, but I don't know all of the details behind this report, so it's very difficult for me to comment on it.

CHAIRMAN SPRITZER: You didn't review it in enough detail to have an opinion on it?

MR. KUGLER: No, sir.

CHAIRMAN SPRITZER: Whether its

conclusions are valid or not?

MR. KUGLER: No, sir.

MS. CORT: I would add though that again the projections on which we rely do consider the cost of solar and in particular, the rapidly declining cost of solar is embedded in the models that produce the projections on which we based our contributions to the combination of energy alternatives.

CHAIRMAN SPRITZER: But what is your understanding of the trend in costs in solar? You said it's declining. Can you give a little more quantitative information on that?

MS. CORT: Again, it's kind of difficult to look at cost because you have to figure out the cost if installed or the operations cost, the levelized cost. There a lot of different cost factors that are thrown out there, but there was one study I looked at that pulled data from The Annual Energy Outlook, the underlying National Energy Modeling System for the on-site, in-use, photovoltaic solar installation costs declining on the order of 40 percent over the projection period. So pretty significant costs.

CHAIRMAN SPRITZER: What was the projection period?

MR. KUGLER: That was 20 years.

CHAIRMAN SPRITZER: Starting from when?

MS. CORT: This came from AU 2009, so it was 2008 out to -- the projection period was out to 2030.

CHAIRMAN SPRITZER: Okay, do you consider that relevant to determining the commercial viability of the solar, prices declining on the order that you just described?

MS. CORT: That is one thing that we certainly considered in our evaluation of solar.

CHAIRMAN SPRITZER: And how did it affect your conclusions?

MS. CORT: That it was a commercially viable alternative and that it should be considered as part of a contribution to the combination of energy alternatives.

CHAIRMAN SPRITZER: But I take it only up to the amount that you included in the FEIS?

MS. CORT: That's correct, when deriving the contributions, then we relied on these authoritative sources and these projections, since we were looking, a forward-looking analyses, we relied on the projections that do consider again these declining costs as part of their analysis and how they rate

relative to other technologies.

CHAIRMAN SPRITZER: Based on the cost trend described, I would think that the longer the time frame we're looking at in terms of Calvert Cliffs Unit 3, the more solar costs are going to decline. Is that a fair interpretation of what you told me?

MS. CORT: Well, that cost that you'll see in the Energy Information Administration Projections has a pretty substantial cost declining out to about 2016. This is, in part because of some of the tax credits, the investment tax credits that are coupled and factored into that cost which -- and then they sunset in 2016. So after that time period I think it levels off a bit in terms of declining costs.

CHAIRMAN SPRITZER: That's in the DOE projection?

MS. CORT: That's in the DOE projections.

CHAIRMAN SPRITZER: My recollection of this report, JNT-12 though, it seems to project continually declining costs over time. Would that be relevant to assessing the commercial viability of solar in outlying years, I guess you'd call them, after 2020?

MS. CORT: We would again rely on the projections of the Department of Energy and Maryland,

the State of Maryland and their view of the costs and the trends of the costs over time.

CHAIRMAN SPRITZER: Let's assume for purposes of my next question that the NRC were to decide not to license Calvert Cliffs Unit 3, it's hypothetical, not claiming, not stating the result by any means, but let's assume that were the decision. Do you have an opinion whether that decision, not to license Calvert Cliffs Unit 3, would affect the demand for renewable sources of energy such as wind and solar power?

MR. KUGLER: If this plant were not built, the company and the State would be looking for other alternative means to get the power that it needs. In the current situation, this State is already a very large importer of power. It imports about 30 percent of its power. And the transmission grids are not capable of importing really much more than that. So with needs growing, they would have to pursue building something else.

Again, looking at the analysis done by the State, by the Public Service Commission and looking at their Certificate of Public Convenience and Necessity, they determine that this State needs baseload power sources. They felt this Unit 3 would be a good

baseload source. So I would think in all likelihood they would be looking to pursue other baseload sources, potentially I would tend to say most likely natural gas. Natural gas in the past usually was not baseload, but it's getting very difficult to license a coal plant or to get permits for a coal plant. So one of those two though, coal or natural gas, would most likely be the backbone of anything else that they did. They could try and fit other sources in, but because they are looking for baseload power sources, renewables such as wind and solar would probably not be large players in whatever they would end up with.

CHAIRMAN SPRITZER: What about a combined alternative such as you described in the FEIS?

MR. KUGLER: Well, certainly a combined alternative, but even in the combined alternative that we believe would be likely, the renewables are not the big player. It ends up being the natural gas plant that carries most of the load because it can run steadily.

CHAIRMAN SPRITZER: Let's look at NRC-4 which I believe is your direct testimony and that's page 5, paragraph A7.

You state that "the approach used to develop a combination of energy alternatives included

the maximum contribution for renewable sources that could be reasonably expected within the region of interest and within the time frame of the proposed project."

What was the region of interest you considered?

MR. KUGLER: The region of interest was the State of Maryland. It's discussed in the Environmental Impact Statement.

CHAIRMAN SPRITZER: Okay. How does that relate to the estimate of wind and solar power that you used in the combination of alternatives, the fact that you were looking at the State of Maryland as the region of interest?

MR. KUGLER: Well, if you look at the estimates done by the Energy Information Administration, they don't necessarily do estimates state by state. As Ms. Cort mentioned, they do it based on these regions. So in this case Maryland is in the ReliabilityFirst Corporation, East Region. So when we look at those projections, we have to consider that we're looking at a number, four states, not one state. And so we made adjustments in looking at that to consider the relative contribution of Maryland.

In our testimony, we talked about -- we

considered Maryland to be a third of the output of that region to be conservative. That's pretty much certain to be high. I've looked at other numbers that would indicate it's probably more like a quarter of the region. But in order to -- we are trying to be conservative. We said a third. So when we were looking at the projections, we would take the projection by the Department of Energy and take a third of that number to bring it down to what we would consider to be the contribution of Maryland.

CHAIRMAN SPRITZER: Why does the -- do you know why the Department of Energy defines that the region of interest that Maryland is in -- I think you indicated include part of Pennsylvania, Delaware and --

MR. KUGLER: And New Jersey.

MS. CORT: And New Jersey. For this particular submodule of the model they follow some of the divisions that are part of the North American Electricity Reliability Councils. So they're just --

MR. KUGLER: It's just how the grid is broken up into these different regions. They don't necessarily follow state lines. So it's not all of Maryland and it's not all of Pennsylvania.

CHAIRMAN SPRITZER: Is the way they've

created this region of interest reflect the availability of power within that area?

MR. KUGLER: I'm not sure I follow that question.

CHAIRMAN SPRITZER: It was probably not very precise. In defining a region of interest, let me put it this way, does the fact that Maryland is in a region of interest that includes those four areas, Maryland, Pennsylvania, New Jersey, and Delaware, in any way have a bearing on -- for example, does that in any way suggest that power generated within Pennsylvania or Delaware or New Jersey could, in fact, be imported, if that's the right term into Maryland?

MR. KUGLER: Okay, I understand that question. As I mentioned earlier, Maryland already imports a very large portion of its power from other states. And in fact, if you look at the list of the top five states in terms of how much power they important, they're all in this region. So the transmission system is already pretty loaded down in terms of importing power during periods of peak demand.

When the Maryland Public Service Commission was looking at Calvert Cliffs and whether to approve the Certificate of Public Convenience and

Necessity, this is one of the factors they considered was they want to get power sources built in Maryland to support the grid in Maryland. They don't want Maryland to become even more dependent on outside sources because they're competing with other states around them and their grid is already pretty strained. So they specifically were looking for sources to be built inside Maryland.

I think this is one of the reasons in relation to renewables that the State has also taken a position in their renewable portfolio standard that solar resources to meet the renewable portfolio standard must be in Maryland. If you look at that renewable portfolio standard for all of the other renewables, the power companies in Maryland can buy credits from companies outside Maryland to satisfy the RPS. That power does not come to Maryland. They're just getting credit for it.

CHAIRMAN SPRITZER: Can you explain in a little more detail how that works? What exactly would they be buying from a utility located outside Maryland?

MR. KUGLER: They're buying a credit which satisfies the RPS. It's the way the systems work.

CHAIRMAN SPRITZER: How does the utility

outside Maryland that's selling a credit to a utility inside Maryland, how does it get the credit in the first place?

MR. KUGLER: By generating renewable power. Let's say you've got a wind farm up in Pennsylvania somewhere. I mean some of the renewable energy credits I saw in one of the recent reports were from as far away as Iowa. You've got a wind farm in Iowa. A power company in Maryland needs credits. They purchase the credits from you, so you make money off it that way. But you're still generating the power in Iowa and you're selling the power to somebody.

CHAIRMAN SPRITZER: Sounds like an interesting system. Can a utility in Iowa sell credits to more than one state?

MR. KUGLER: Yes. Yes.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: But I mean they can only sell credits for what they actually generate.

CHAIRMAN SPRITZER: No, I understand.

MR. KUGLER: They can't sell them twice.

(Laughter.)

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: It's just the way the systems

are set up. Maryland's RPS is not unusual in that regard.

CHAIRMAN SPRITZER: I was going to come to the RPS eventually, but I guess we're already there. So if I'm understanding your testimony correctly, if I'm a Maryland utility, I could satisfy an RPS requirement by buying credits from another state even though that has no effect on the amount of wind or other renewable designated renewable sources of power actually generated within the State.

MR. KUGLER: That's correct. And the only exception is solar. They carved that one out especially -- for solar power the facility must be in Maryland. It doesn't have to be owned by this power company. They can buy credits from somebody else who builds a solar facility. But it has to be within Maryland.

CHAIRMAN SPRITZER: In terms of the region you were looking at, as I understand it, offshore wind, for example, as it's described in the Applicant's Exhibit 10 that we were looking at before, it's beyond the three-mile border. Well, let me go back a minute. Do you have an understanding of whether the border of Maryland where it ends when we're going out to sea? How far do we have to go

before we're no longer in Maryland?

MR. KUGLER: I'm not certain. I think for most states it is three miles.

CHAIRMAN SPRITZER: Would you have disqualified a wind source because it's not within the border of Maryland, an offshore wind source because it's not within the border of Maryland?

MR. KUGLER: If it was offshore of Maryland, we would have included it.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: Regardless of how far out.

CHAIRMAN SPRITZER: All right. What about if it's offshore in Delaware? Would that have been excluded?

MR. KUGLER: We would not have included that because it was not within Maryland because again, we were looking at that as our region of interest. And actually, that's our region of interest and the State, as I said, is of the same opinion that they need sources inside the State. And based on that, we felt that that was the appropriate region to use.

CHAIRMAN SPRITZER: Leaving aside for a moment of what the State prefers though, if we're looking at what's a technologically feasible and commercially viable alternative to Calvert Cliffs Unit

3, would that include in your opinion wind power generated off the coast of Delaware? Let me back up a minute. There's no assumption built into that, I guess. Could wind power generated offshore of Delaware supply power to Maryland utilities? And if so, how would they go about doing it?

MR. KUGLER: It's possible it could. I don't -- I'm not sure of the grid structure between Delaware and Maryland. The most congested areas are typically to the north and the west. That's where the transmission lines are fairly congested. That's where a lot of the power comes into the State. I don't think Delaware typically has been a significant power provider to Maryland. So if there's grid there and there's room available, it would be possible to do that.

CHAIRMAN SPRITZER: Okay, as I understand your testimony, you would have excluded that even if it's possible?

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: From the combined alternatives used in the FEIS?

MR. KUGLER: That's correct, because we're using a region of interest of Maryland.

CHAIRMAN SPRITZER: Now coming back to the

timeframe issue, you told us that -- the FEIS itself, I guess, tells us that the timeframe used in the FEIS itself is December of 2015.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: Now sitting here today, do you believe that's a realistic estimate of the start-up commercial operations for Calvert Cliffs Unit 3?

MR. KUGLER: Well, considering that the Applicant now believes it's December 2017, I would say no.

CHAIRMAN SPRITZER: Did the review staff believe at the time that that was -- the issue in the FEIS, that it was a realistic estimate?

MR. KUGLER: I was not involved in writing the section where we developed the purpose and need, so it's difficult for me to answer that question.

CHAIRMAN SPRITZER: All right. And you stated, this is in a footnote of your testimony, I believe, that the current projected date for the completion of construction is December 31, 2017. How, if at all, does that -- what, if anything, does that tell us about start-up commercial operations.

MR. KUGLER: Well, I think the two terms are almost interchangeable, completion of

construction, commission of commercial operation, I believe are synonymous. Once you finish your building process, you're testing the systems as you build it and so you do have a testing phase you go through, but Applicant may actually be better suited to respond to that question than I am.

CHAIRMAN SPRITZER: Does the NRC have a definition of what constitutes the start-up commercial operations in terms of power output, for example?

MR. KUGLER: I believe we do, but I'm not sure what it would be. I can tell you from personal experience I worked at a plant under construction. Commercial operations date meant the point at which we had completed all of our testing and we received an operating license from the NRC and were capable of operating 100 percent power.

CHAIRMAN SPRITZER: Did the review team make an independent determination of when it believes that is, when the review team believes commercial operations are likely to begin for Unit 3?

MR. KUGLER: In the portions that I worked on, we did not discuss that. I don't know if others -- there may have been other portions like purpose and need where they did.

CHAIRMAN SPRITZER: Now you're aware --

well, are you aware that the NRC staff has made a determination that a license cannot be issued to Unit 3 due to the current foreign ownership situation, cannot be issued at present for Unit 3 due to the foreign ownership issue?

MR. KUGLER: Yes, sir. I am aware of that.

CHAIRMAN SPRITZER: Was that taken into account in any way in establishing the timeframe for looking at the combined alternative?

MR. KUGLER: Again, the timeframe was really worked out in other sections and then we used that information, but at the time that we were preparing the EIS, originally that information did not exist and honestly, I'm not certain at what point that information became available to us. I'm not sure when that determination was made. I know there was a letter that went to UniStar, but I don't recall the time frame of that letter. So how that fit in with our work on the Final Environmental Impact Statement I'm really not sure. But from the perspective of performing this analysis, I would not have seen that as an issue to be considered. It's a hurdle that has to be overcome and dealt with one way or the other.

As I said, we're not stating in the EIS

this plant is going to get built. We're stating this is what's been proposed to us and we're comparing it then to other options.

CHAIRMAN SPRITZER: Okay, I understand your position on that. Do you have an understanding of the estimated construction time for Unit 3, that is, once a license is issued and they start construction, how long would it take to complete construction?

MR. KUGLER: I don't think I've seen a specific number on that or if I have it, I don't recall it.

CHAIRMAN SPRITZER: Do you know when a license is issued, how long the licensee has to complete construction?

MR. KUGLER: Well, the license is for 40 years. And I know from experiences in the past, the plant doesn't necessarily get built immediately and there can be delays. I don't think there's anything that says they have a deadline to complete construction. The Watts Bar units would be an example of plants that had significant delays in construction.

CHAIRMAN SPRITZER: I believe Watts Bar, what is it, Unit 2 is still under construction.

MR. KUGLER: Yes, sir.

CHAIRMAN SPRITZER: As we speak. Do you know approximately when that was licensed?

MR. KUGLER: I'm not certain, but I think it might have been late --

MS. CORT: 1972.

MR. KUGLER: I thought it was maybe late '70s because what I recall, when -- we prepared a Supplemental Environmental Impact Statement for the licensee at Watts Bar Unit 1 when they wanted to complete construction and I believe there had been at least a 15-year lag, so I'm thinking late '70s, but I'm not certain.

CHAIRMAN SPRITZER: On page -- turn to page 18 of the direct testimony. It's the same exhibit, NRC-4. I believe you state there and I'm not sure if it's on the screen, yes, there it is at the top. You refer to the ReliabilityFirst Corporation assigning the Bluewater Wind Project in Maryland a confidence factor of 21.6 percent. And you tell us what that means, the confidence factor is used by RFC to estimate the portion of conceptual capacity to include in its planning.

Is this essentially telling us the probability that this unit would actually or this combination of units, I guess, would actually be

built?

MR. KUGLER: It's a tool that they use, they being ReliabilityFirst Corporation, to try to plan ahead as to what will come on line. They recognize, and the point of this part of the testimony is simply that this project, like many projects, there's a fair bit of uncertainty as to whether it will actually be built.

And so they use these confidence factors to try not to over count proposals that they have before them because if they do, their planning based on every proposal they have in front of them, and then some of them don't come to fruition, they may have problems managing their grid. So it's just a tool that they use to try and measure them.

CHAIRMAN SPRITZER: Did you look at this or any other source to determine the confidence factor for Calvert Cliffs Unit 3?

MR. KUGLER: I believe it did have a number for Calvert Cliffs Unit 3. I don't recall what that number is.

CHAIRMAN SPRITZER: If we look through the exhibit, maybe we'll be able to find it. We don't need to do that now.

MR. KUGLER: Okay.

CHAIRMAN SPRITZER: It's something we can do later. Now it's my understanding, and correct me if I'm wrong, that the Constellation Energy Group decided to withdraw as a partner in UniStar?

MR. KUGLER: That's what I understand. Yes, sir.

CHAIRMAN SPRITZER: Are you aware of the reasons for that decision, at least to the extent they were publicized?

MR. KUGLER: I don't really recall to be honest. It's not something that I was directly involved in.

CHAIRMAN SPRITZER: I think you told us before that you were aware that UniStar had applied for a loan guarantee from the Department of Energy?

MR. KUGLER: I'm aware that they have, yes.

CHAIRMAN SPRITZER: Okay. As far as you know that has not been approved today, is that correct? Or do you have any knowledge of that?

MR. KUGLER: I don't know.

CHAIRMAN SPRITZER: Okay. Is it fair to say, well, let me back up a minute. Do you have any knowledge of current prices for natural gas and how they may have affected the probability of future

nuclear plant construction?

MR. KUGLER: I don't know what the numbers are. I do know that at this time natural gas prices are pretty low, and that makes it obviously fairly attractive as a source of power. I think though that from my understanding, the power companies are a bit circumspect about that because there have been low gas prices before. They've also gone quite high. Those of us living in Maryland have experienced the outcome of that in our electric bills.

So what I've seen is that power companies try to have a range of energy sources in their portfolio so that no one energy source will so heavily drive their prices that if something happens to drive those prices up that the customers are completely at the mercy of those.

So at the moment, yes, natural gas is fairly inexpensive and that will probably play a role in the near-term decisions that power companies make. But I think a lot of power companies will also be looking for other sources so that they have some balance in their power generation portfolio.

CHAIRMAN SPRITZER: This is a convenient breaking point. We will have some further questions for you after lunch, but I think this will be a

convenient breaking point.

Mr. Mariotte, any new -- any word on Mr. Sklar?

MR. MARIOTTE: No, Your Honor. We've left messages on his cell phone and his message service and my office. We have to assume he's somewhere where he can't receive those messages which I assume is about 30,000 feet in the sky.

CHAIRMAN SPRITZER: Do you have his flight number that he was coming in on?

MR. MARIOTTE: No, no. We tried to check for flights from Costa Rica which apparently is where he was. But we don't know which flight he was on.

CHAIRMAN SPRITZER: All right. Well, we have a few more questions for these witnesses after the break and I do and I believe at least one or both of my fellow Judges probably do, but we're probably not looking at much more than an hour with them. So I guess we, together with counsel for the other parties can ponder what we're going to do if Mr. Sklar does not appear.

MR. MARIOTTE: I apologize, Your Honor. I just don't know what to say.

CHAIRMAN SPRITZER: I understand it's not directly under your control. So you may want to think

about -- we'll talk about this at some point, I guess when it becomes clear that he's not going to be here or whether he is going to be here or not.

All right, we'll stand adjourned for lunch. Thank you.

ADMIN. JUDGE SAGER: What time should we return?

CHAIRMAN SPRITZER: Oh, that's a relevant question. One thirty will be a good time to come back.

(Whereupon, at 12:15 p.m., the evidentiary hearing was recessed, to reconvene at 1:30 p.m.)

A F T E R N O O N S E S S I O N

2:10 p.m.

CHAIRMAN SPRITZER: All right. Any other administrative matters before we continue?

(No verbal response.)

No? Hearing nothing, we'll continue with the staff's witness. Just to remind you you're still under oath.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Let's turn to NRC Exhibit 4. That's the direct testimony of the staff witnesses at page 12, paragraph A-11. I think that's right.

As I understand this, you used -- First of all, you used the Environmental Standard Review Plan Guidance on Alternatives.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: In your alternatives analysis for the FEIS. But, as I understand it, you also used guidance which is NRC 10 and that's guidance on doing accumulative impasse (phonetic) analysis. Is that correct?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Okay. And using NRC 10 I take it what you did was you looked for actions which had been approved by the proper authority who have submitted license permit applications for which may not require approval of a regulatory agency but for which procurement contracts have been signed. If that were the case, you would treat something as being reasonably foreseeable.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: On the other hand -- Well, let me ask. Were those -- Did at least one of those conditions have to be satisfied for you to consider a particular alternative to be reasonably foreseeable?

MR. KUGLER: It didn't have to be satisfied. We used this as guidance. If you look at the very end of that paragraph, it mentions "future actions that do not fall under the definition of reasonably foreseeable but could potentially take place as indicated by trending in the vicinity or less formal communications may be addressed in a general manner."

In looking, in going through our process and looking to the future through Department of Energy and State reports, we recognize that especially

because of the length of time we're looking out, there could be projects that have not yet reached the point of meeting that definition of reasonably foreseeable but that are likely to occur just because there are trends in building those types of facilities.

For instance, we know that solar is being built. And we expect that to continue. And, although there may be no announcements of projects that add up to the amount of power we're talking about, we expect that trend to continue. So the guidance allows us to consider those sort of factors as we evaluate what's likely to occur in the region.

CHAIRMAN SPRITZER: Let me just ask this. Why did you feel the need to use -- You have guidance on doing alternatives analysis.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: And you looked at that. Why did you have to then also look at guidance on doing accumulative impact analysis?

MR. KUGLER: Well, the guidance that we have on the alternatives analysis does talk about looking forward at what is likely to occur in the region by looking at things like what is commercially viable, technically feasible. It doesn't really ever define though what is meant by reasonably likely,

reasonably foreseeable.

And so we've been working a lot in cumulative packs as well. And the basic premise of the way we approach cumulative packs really makes sense in the same context. We're trying to find what there is out there that has been announced in one form and another. And it appears to be moving forward.

We're trying to get a sense of the likely actions to occur in the area. And we take all these factors into account. It's not one thing or another really. It's a combination of these factors as we work through what we're going to include in the combination of alternatives.

CHAIRMAN SPRITZER: All right. Am I correct that if an alternative only been discussed on a conceptual basis it would necessarily be excluded by the NRC staff from further consideration as an alternative?

MR. KUGLER: If it has only been discussed as a concept technologically or do you mean conceptually in the sense that if somebody said "I think I want to build a windfarm"?

CHAIRMAN SPRITZER: Yes, the second.

MR. KUGLER: The second one, okay. What we looked at there -- We went for instance on wind,

offshore wind in particular. We looked at a report that was prepared by the National Renewable Energy Laboratory where they were looking at how progress has been moving on offshore wind. And they looked at a number of projects that are being considered throughout the country. And they had grouped a certain portion of those as being projects that they provided more detail on because they had progressed to a point where they felt that these were projects that looked like they may go forward. That was one approach we had, looking at sources such as that.

As we've talked about Department of Energy, the Engineering Information Administration, they do their projections. The State also makes projections. And we take all that information and from that we try and develop what looks to be a reasonable input for each of the different types of energy.

The Energy Information Administration does work on a regional basis. The State, of course, is looking very specifically at what they see occurring here. So between those two we feel like we developed what makes sense for this region in this time frame.

CHAIRMAN SPRITZER: Let me tell you though. I've been sort of thinking about this over

the break and whether this is a question for your lawyers or for you. Let me try it for you.

As far as I know, neither of you is an attorney. So I'm just asking for your understanding. I'm not asking you to tell me what the law is.

I guess the problem I'm having is my understanding of what's required from an alternative analysis is something has to serve the purpose and the need of the project and tells us what that is. It has to be technologically feasible, total wind and solar technologically feasible. It has to be commercially viable at least by the time that it would need to be installed. But as I understand it and as I read your guidance on alternatives if those criteria are satisfied, that's a reasonable alternative.

Now your analysis as I'm reading it in your direct testimony and in the EIS seems to be introducing or at least could be read -- you can tell me if I'm misinterpreting this or not -- to be introducing an additional requirement that in essence you need to be able to find some indication, a permanent application, contract for construction, something that convinces you not only is this technologically feasible but commercially viable but actually will or likely to be constructed within a

given time frame.

MR. KUGLER: Okay.

CHAIRMAN SPRITZER: That's my problem. Maybe you can tell me either that I'm misinterpreting what you did or that I am correctly interpreting what you did.

MR. KUGLER: No, it isn't exactly what we did. As I said, if you take a look at what we have listed as our combination of energy alternatives, if you take solar for example, we talk about 75 megawatts base load equivalent power. So that's really a power output on average. And to get there you would need at least 300 megawatts of solar installed.

That amount is far in excess of whatever has been announced right now. So we didn't limit ourselves to just what has been announced. When things have been announced and they are moving forward, that gives us some confidence those things will, in fact, happen.

So there is a certain amount of balancing to make sure that what we are developing makes sense. For example, let's say we ran into a situation perhaps where the projections we were looking said, "Well, we only expect 100 megawatts of whatever."

But we've got applicants over who is

developing 150 megawatts of that resource and they're well along in the licensing process. And they've got their financing and it looks pretty real.

I think in a situation such as that I would say "Well, even if the projection is 100" -- I don't think we use 100. We use at least 150 because that looks like something pretty real.

We actually ran into a situation like that in another application where the projection that we were looking at -- I don't recall the exact numbers -- where the applicant in their renewable energy work was actually proposing more wind energy than the current projection showed for that area. Well, in that case, we used what the applicant said they were planning to do. We weren't going to use the projections because it looked like things must have changed enough in the region that they were now planning more than the Energy Information Administration had projected at the time they prepared their annual report.

We look at all of that information. We don't limit ourselves to just one thing. In fact, what we have given in our combination of energy alternatives is over what Energy Information Administration actually projects for this state once we have taken it down to the state level which is an

estimate.

But we went a bit over that because Maryland is trying to implement an RPS. They are trying to get renewables built. There is strong interest in it. So we gave them a little margin on that, although there wasn't anything real specific that we could point to and say, "Here clearly they're going to build more than what EIA said." But we felt if we were going to err we were going to err on the higher side.

MS. CORT: If I could just add regarding the process. In the Section 9.2.3 of the EIS, we go through and evaluate and assess various alternative energy sources in terms of the commercial viability and the technical feasibility.

And in some cases some of them were determined not to be commercially viable, for example, fuel cells, at this time based on some of the reports that we were reading from the Department of Energy. Some might not be technically feasible in the region of interest such as geothermal for example.

And the list of the others, solar and wind for example, we did determine that they were commercially viable and technically feasible up to a point but in and of themselves weren't able to meet

the purpose and need of the proposal in front of us. In that case what we did is then turn to the combination of alternatives and brought some of these together such that in combination they would be able to meet the purpose and need of the application. It's not as if we determined they were commercially viable and technically feasible. Or we did not dismiss them entirely.

But we saw that they weren't able to meet the purpose and need in and of themselves. So then we turned toward the combination of energy alternatives.

CHAIRMAN SPRITZER: As I understand your testimony, the reason they couldn't meet the purpose and need themselves as wind and solar is some means of generating base load power and they can't do that by themselves. Is that -- Am I understanding correctly?

MS. CORT: Yes, that is correct. Also the levels that seem to be available. The availability of that resource in the region seem to be limited. And that came into play when we were developing and deriving the combination of energy alternatives.

CHAIRMAN SPRITZER: I don't want to belabor this point unnecessarily. But I guess maybe I can ask the question this way. Is availability an additional requirement on top of technological

feasibility and commercial viability, availability by the start date of the project or, excuse me, by the start of commercial operations for the project?

MS. CORT: Well, you know as we have mentioned before again relying -- It's a forward-looking analysis. Looking into the future, we relied on the information from the State of Maryland and the Department of Energy on their projections.

And as part of these projections we've mentioned earlier that the cost of the technology and the performance of a given technology is considered in addition in those projections. There are other considerations such as availability of the resource in the region, utilization, load profiles, environmental constraints, policy and regulatory factors. So all of those are part of the projections. In relying on some of these projections that we do we are in effect looking at all those different aspects.

CHAIRMAN SPRITZER: Let's look at the FEIS. I believe it's page 9-8. But FEIS is Exhibit NRC 3A, 9-8 I believe. I'll check that for you in a minute. Yes, 9-8, Chapter 9. Yes, there you go. You got it. You had it. Yes, coal fire. We want to start with the title "Coal Fire Generation." Do you have that available to you?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Now this talks about an alternative, the coal fire generation alternative. And it says, "Review team assumed construction of super critical pulverized coal fire units at the Calvert Cliff site." And if I'm reading this correctly I assume you took that to be a reasonable alternative to Calvert Cliffs 3.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: I would assume -- Well, tell me. This plant has not been submitted for licensing or there are no construction contracts that you know of for such a plant, are there?

MR. KUGLER: No, there are not, Your Honor. But there are coal plants of this nature within the region.

CHAIRMAN SPRITZER: Did you consider construction of a coal plant at the Calvert Cliffs site by the end of 2015 to be reasonably foreseeable under the test that you've described?

MR. KUGLER: The basic approach that we take in our guidance is to determine what forms of energy generation are available that could meet the purpose and need of the proposed action. So when we look at that we can determine pretty quickly "Okay.

We've got a need for base load power. Fairly large magnitude. What can do that?"

Well, we know coal plants can do that. And we know there are coal plants in the region. It's reasonable to think somebody could build another coal plant. Likewise with natural gas. It's pretty clear that that's a possibility. That's an option that could work.

When we started looking at the other energy sources, we take a look at whether or not they could actually carry this out individually. In Section 9.2.3, we look at each source individually such as wind, solar, hydropower and determine whether it appears that that resource by itself could carry out the purpose and the need of the proposed action.

And in Section 9.2.3. we found, for instance, with wind and solar that it did not appear realistic that they could carry that out in main because they are intermittent sources. So the approach we're taking focuses in on whether or not the option could be done.

And when we looked at wind and solar we took that same approach. We weren't even at that point in Section 9.2.3 looking to see really how much is likely to occur here.

The first test is can it even do the job. And we concluded that wind by itself could not do the job. Solar by itself could not do the job.

Now when we get into Section 9.2.4 we're now looking at a combination of energy alternatives. We're trying to develop a mix of these various alternatives. And so we need to set a value for them, how much we should include as a contribution from wind and solar, biomass and so on.

And our goal is to try and establish a combination of energy alternatives that has the least environmental impact. Because what we're trying to determine is, is there some alternative that would be environmentally preferable to the proposed action?

So as we go through that process we need to establish some sort of parameters on how much to expect from each of those resources. And that's where we start getting into looking at how much can we reasonably expect to see in this region in order to establish some sort of numbers to include in that combination.

CHAIRMAN SPRITZER: Okay. I understand and I think that covers some areas that we've already talked about. But I'm focusing on the coal fire alternative right now. And to me -- tell me if you

disagree -- I understand that it could fulfill the purpose and need of the project. It's technologically feasible, probably commercially viable.

And you seem to have treated that here as sufficient to treat that as a reasonable alternative. You didn't have to get into this business of looking for projections and looking at DOE studies or any of that. Feasible, commercially viable and fulfilled the purpose and need. And you have appeared to have included it solely on that basis as a reasonable alternative. Is that a fair summary of what you did with respect to coal fire generation?

MR. KUGLER: Can you give me just a moment?

CHAIRMAN SPRITZER: Sure.

(Off the record discussion.)

MR. KUGLER: In carrying out the review under our guidance, we focus in on those energy sources that as we've discussed technically feasible, commercially viable. If you look at the lead-in to the discussion of coal, the preceding subsection, where we talk about options that include the generating capacity, we talk about where does power come from in the United States and in Maryland.

And the bulk of the base load power in

particular, base load power comes from coal and nature gas. So we do tend to focus in on those two options as known options capable of directly meeting the purpose and need of the project.

So I'd say, yes, we focus in on whether technically feasible and commercially viable. And we do look I believe -- Let's see. If you look at page 9-7 towards the bottom.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: In the last paragraph, we do consider what the Energy Information Administration is projecting as a whole where they do talk about what they expect to see in terms of new generation. So natural gas plants are the biggest player in the future as they see it at about a little over a half of what's going to be installed. Renewables as a group is also fairly big at 27 percent. Coal fire at 14 and then nuclear at five.

We know that there are going to be coal fire plants. There will be gas plants built. And there will be renewables built.

Now those numbers are for the nation as a whole. And so we do focus in a bit more on what's likely in Maryland. But based on their ability to meet the purpose and need directly we include those as

options in our evaluation. And then we consider whether they would be environmentally preferable.

CHAIRMAN SPRITZER: Just a few more questions on this. I think you've already told me you know of no current plan to build a coal-fired plant at Calvert Cliffs site. Is that correct?

MR. KUGLER: I think I can state pretty clear there's no plan to build a coal-fired plant at Calvert Cliffs. That's correct.

CHAIRMAN SPRITZER: And the State of Maryland I think you've talked earlier about their policy in terms of energy development. Is it fair to say that it does not favor construction of new coal generation capacity?

MR. KUGLER: I'm not sure that would be true. I must admit I'm not certain about that in their policies.

CHAIRMAN SPRITZER: It would, however, require if such a plant were to be built at the Calvert Cliffs site or anywhere else for that matter what's it called? A certificate of public convenience and necessity from the State of Maryland?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: With respect to -- You also discuss and I believe this is on page 9-14,

National Gas-fired Generation, you assume construction of a natural gas-fired plant located at the Calvert Cliffs site. Am I also correct that you know of no plan as of today to construct such a plant at the Calvert Cliffs site?

MR. KUGLER: Yes, that's correct, Your Honor. If I could explain a little bit about why we in our evaluations use the Calvert Cliffs site. We're trying to the extent possible to compare apples to apples. So as we're working on the environmental impact comparison between coal, natural gas and nuclear, we put it at the same site. So you're dealing with the issues in each location.

If we were to do it any other way to use some other site, we wouldn't know where that site was. We wouldn't know what the environmental conditions are.

When we start getting into some of the other energy sources, it becomes a little problematic. So, for example, you can't build offshore wind on the Calvert Cliffs site. When we get into some of those other energy sources, we have to accept that it's going to have to be at some unknown location other than Calvert Cliffs.

But in order to make the comparison as

fair as possible we use the proposed site for the types of power generation that could be built at that site.

CHAIRMAN SPRITZER: In light of that comment, let me ask. Do you know of any current proposal to build a coal-fire generation plant of the type you're talking about here, a super critical pulverized coal-fired unit, in Maryland that will produce 16,000 megawatts of electric power anywhere in the state? Any such proposal?

MR. KUGLER: No, I'm not aware of such a proposal.

CHAIRMAN SPRITZER: Is there such a proposal with respect to gas-fired generation?

MR. KUGLER: I'm not aware of one. No, sir.

CHAIRMAN SPRITZER: But I take it you concluded and I think this is quite reasonable that those would still be reasonable alternatives to construction at Calvert Cliffs.

MR. KUGLER: Yes, Your Honor. I would point out again that even in the combination of energy alternatives the amount of solar and wind that we included we don't know of projects that would fulfill all of that either. So it's not just the coal and

natural gas that it would be true of.

CHAIRMAN SPRITZER: Does the NRC-10 which is the Cumulative Impact Guidance that you referred to earlier state anywhere that it should be used or for that matter that it should not be used in conducting an alternatives analysis?

MR. KUGLER: It doesn't say one way or the other, Your Honor.

CHAIRMAN SPRITZER: I looked. I didn't find that either. What about the guidance you used which I believe is NRC Exhibit 8 on conducting the alternatives analysis? Does it suggest anywhere that you should look to guidance on cumulative impacts to do the alternatives analysis?

MR. KUGLER: No, Your Honor. It does not.

CHAIRMAN SPRITZER: Are you aware of any other FEIS other than the one for Calvert Cliffs Unit 3 where the review team for that FEIS has made use of the Cumulative Impacts Guidance to do an alternatives analysis?

MR. KUGLER: Well, I've worked on several of the combined license applications and we use the same basic approach in each case where we're looking to determine what is likely to be built or could be built in the region during the period we're

considering. I believe we've been fairly consistent in that.

CHAIRMAN SPRITZER: Okay. Getting toward the end here. Turning to Section -- We're still in the FEIS. Let's turn to Table 9-3 which is on page 9-29 I guess at the top to the extent we can focus in on that. Okay.

Now this summary of impacts is based on the combined alternative as you constructed it, not the modified version that assumed additional 300 megawatts for a total of 700 megawatts of the alternative energy sources.

MR. KUGLER: That's correct, Your Honor. This is the table associated with the actual combination that we used. The other scenario we did not create a separate table for because we weren't analyzing in detail. We were just using it as an example.

CHAIRMAN SPRITZER: And I take it you then go on to discuss the possibility of adding an additional -- What is it now? It would add an additional 300 megawatts of base load power to the 400 that you start with which would require -- what does it say -- for the wind contribution and installed capacity of at least 1,000 to 1,200 megawatts with a

400 megawatt electric CAES plant. That's the last paragraph on page 9-28.

CHAIRMAN SPRITZER: And you say this is on -- Now we're shifting over to page 9-30 at the top. You say, "The impact categorizations in Table 9-3 would not change except that impacts to land use and ecology might become large if onshore wind energy is used." Do you see that?

MR. KUGLER: Yes. Yes, Your Honor.

CHAIRMAN SPRITZER: Now let's go back to Table 9-3. Getting a workout here on page 9-29. I guess I'm a little -- You're saying even with that change the ranking or -- what do I call it -- the characterization small to moderate for air quality would not change.

MR. KUGLER: That's correct, Your Honor. If you -- And we talked a little bit about this earlier. If you take a look at the emissions that we're talking about in this table, if we go to this other scenario where we increase the wind by 300 megawatts, we would decrease the natural gas by 300. So now it goes from 1200 megawatts down to 900.

CHAIRMAN SPRITZER: Right.

MR. KUGLER: Roughly speaking for the purpose of this evaluation, you would take these

emissions and they would be about three quarters that value that's in the table.

For instance, you see two emissions would go from 4.2 million tons a year to something just over 3.0 million tons which is still pretty significant. This is still a large natural gas plant. And so in our judgment the air quality impacts would still be small to moderate. It would still be in the same category.

CHAIRMAN SPRITZER: And I think you told me earlier that you assumed because you're going from a 1200 to a 900 megawatts gas plant you would roughly reduce the emissions quantities that appear here under air quality by roughly 25 percent.

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

CHAIRMAN SPRITZER: So you didn't actually need to run a new -- Well, tell me this. How is Table 9 -- The data that appears on Table 9-3 for air quality, how did you generate that data?

MR. KUGLER: Well, the data, we go to -- There are a series of tables that the EPA puts out that have factors for emissions for different fuels, coal, natural gas. And based on the size of the plant we can calculate then what the emissions would be for

a given power level. And that's where these numbers were derived from.

CHAIRMAN SPRITZER: So it's not -- You don't have to use a complicated model of any sort.

MR. KUGLER: No, Your Honor. It's relatively straightforward.

CHAIRMAN SPRITZER: Now for what we talked about before you're familiar with the Maryland Renewal Portfolio Standard or RPS Standard.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Is it reasonably foreseeable that Maryland utilities will comply with that standard?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Let's look at Applicant's Exhibit 10, page 23, Table 6.

MR. KUGLER: I'm sorry, Your Honor. What page was that?

CHAIRMAN SPRITZER: We're on -- This is Applicant's Exhibit 10, page 23, Table 6 which appears at the top.

MR. KUGLER: Okay. I'm there, Your Honor.

CHAIRMAN SPRITZER: Okay. Yes, I remember this one. If you want to look over the preceding pages, I don't know if this may help to put this table

in context. You might take a minute to look it over and let me know if you're ready to proceed.

MR. KUGLER: Okay. Your Honor, I think I'm ready. Let's proceed.

CHAIRMAN SPRITZER: Okay. Actually, could you look at Table 5 also?

MR. KUGLER: Okay. I understand what they're doing there.

CHAIRMAN SPRITZER: I mean as I understand it and of course please correct me if I'm wrong this is attempting to calculate. Table 5 is attempting to calculate or is calculating the renewal energy credits that will be needed for Tier 1 resources.

MR. KUGLER: Right.

CHAIRMAN SPRITZER: Beginning in 2007 and continuing up to 2022.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: That's the righthand column, RECs needed for compliance. And I take it that's determined by multiplying the percentage for Tier 1 resources in the column labeled Tier 1. You multiply that by retail electricity sales apparently measured in megawatt hours. And that's going to tell you the RECs needed for compliance.

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

An REC, a REC, is equivalent to 1 megawatt hour of generation by whatever the resource is that's being used to meet the RPS Standard.

CHAIRMAN SPRITZER: And wind power is one of the Tier 1 resources.

MR. KUGLER: It is one option. Yes, Your Honor.

CHAIRMAN SPRITZER: And there are a number of others. I think they're listed in Footnote 11 beginning on the bottom of page 21. It says, "Wind, qualifying biomass which apparently excludes sawdust, methane from anaerobic decomposition of organic materials in a landfill or wastewater treatment plant, geothermal, ocean energy including energy from waves, tides, currents and thermal differences, fuel cells powered by methane or biomass, hydroelectric plants less than 30 megawatts and poultry-litter incineration facilities connected to the Maryland distribution system."

All those I take it make up Tier 1.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Is that list accurate as to the best of your knowledge?

MR. KUGLER: I believe -- It looks fairly accurate. I know that the State has their own reports

on this. But that looks fairly complete.

CHAIRMAN SPRITZER: So utilities all -- Let me ask this. When it says, "RECs needed for compliance" in the righthand column, is that -- I would assume that's for all utilities in Maryland. Is that right?

MR. KUGLER: Yes, that's for the state as a whole.

CHAIRMAN SPRITZER: And for each utility they determine how many sales they've had in the given year in terms of megawatt hours multiplied by the program percentage that appears in the Tier 1 column. And that tells them how many RECs they need.

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

CHAIRMAN SPRITZER: RECs is in capital R-E-C which stands for Renewable Energy Credit.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: Now if I understand Table 6 correctly which is moving on back to page 23 where we started, it looks like what they're doing here is making certain assumptions about the percentage -- this is in the lefthand column -- of the 2022 REC obligation that will be met with wind power. Now on that basis they are then determining, perhaps I should say estimating, land-based and offshore

installed wind capacity that would be needed to meet that obligation assuming the percentage of wind power is correctly stated in the first column.

MR. KUGLER: I believe what they're doing here is indicating what it would look like, for example, if you met 25 percent of the RECs with wind. You would need -- if it was land-based -- 1,114 megawatts of capacity or if it was offshore 975. They're not saying that that's what has to be done.

CHAIRMAN SPRITZER: I understand.

MR. KUGLER: Or will be done. Okay.

CHAIRMAN SPRITZER: Now can you tell -- I couldn't -- whether the land-based installed capacity needed and the offshore installed capacity are alternative ways of meeting the REC? Or are you going to need both?

MR. KUGLER: I'd have to check the numbers, but it looks to me like they're saying either or. It's not both.

CHAIRMAN SPRITZER: And since we're talking if this is based on Table 6 which is looking at the year 2022 and Table 5 tells us that in that year 18 percent of retail electricity sales have to come from Tier 1 resources.

MR. KUGLER: That's not quite correct, but

almost. Well, it's because of the way the program is set up. There are other options. Although my understanding from the reports I've looked at from the State is that for most Tier 1 resources, basically the ones we're looking at here, there is an expectation that the Renewal Portfolio Standard will be met through RECs, renewal energy credits. Not necessarily from within the State, but through RECs.

There is an alternative to pay -- It's called an alternative compliance payment which basically is if you don't get all of the credits that you need you can pay money instead. So that is an option. But the State expects for the most part that for these resources that they will be able to satisfy the Renewable Portfolio Standard with RECs. They won't expect to see alternative compliance payments for these resources.

CHAIRMAN SPRITZER: For the Tier 1 resources?

MR. KUGLER: For these Tier 1 resources. There's one other Tier 1 resource that's not included in that table and that's solar.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: It's treated separately because it's a special carveout.

CHAIRMAN SPRITZER: Okay. And that added an additional two percent.

MR. KUGLER: Two percent. That's correct.

CHAIRMAN SPRITZER: That gets us up to the 20 percent total --

MR. KUGLER: Correct.

CHAIRMAN SPRITZER: -- intended by 2022.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Okay. Now do you think -- Well, let me ask this. Do you have an opinion -- you don't have to have one -- as to whether wind will make up 25 percent more or less? Is that a reasonable estimate of what percentage of the standard would be met with wind power in 2022?

MR. KUGLER: I'm trying to recall the numbers that I've looked at. There's a recent report by the State. It's called A Long Term Electricity Report in which they estimated what they think will happen in the State in terms of renewable energy. I don't know if we want to try and call that one up. It's Applicant's Exhibit 5.

CHAIRMAN SPRITZER: That would be helpful.

(Off the record discussion.)

MR. KUGLER: If we go to -- We have a couple of different places we could look at. But if

we go to page 9-5 and let's go to the top of the page. Now this graph is showing what they call their reference case. So basically when I see reference case I generally read that to mean what they think is most likely.

So this is a reference case that Maryland has put together for renewal energy generation. And if you take a look at that the wind power is in blue. And it comes up relatively quickly through 2012 and then pretty much flattens out at that point.

The solar starts out really small, but it does continue to grow until about 2018 it looks like. And then it starts to flatten out. And I think some of that may relate to incentives when incentives are going to run out.

The biomass and landfill gas, landfill gas grows pretty quickly and then flattens out pretty quickly. And then biomass grows gradually throughout the period it looks like and then flattens out toward the end.

If you look at what they're talking about here, if you look at the wind power, it looks like they're expecting -- I think when I looked at this I blew it up really big so I could try and estimate. I think I estimated it was about 560 gigawatt hours of

generation.

Let's see. So that's 560,000 megawatt hours as opposed to here over three million. So it's about roughly one-sixth of that 25 percent. What they're projecting is probably more in the range of five percent, four percent, of the renewable energy in the State coming from wind.

CHAIRMAN SPRITZER: So that's significantly less than this document would say.

MR. KUGLER: Again, this document is saying this is what it would look like. It wasn't saying necessarily that's what's going to happen.

CHAIRMAN SPRITZER: Right. Can we tell looking at this Figure 9.3 on -- What is the document number?

MR. KUGLER: It's five, Applicant Exhibit 5. What is your question?

CHAIRMAN SPRITZER: Well, does this allow us to compute the percentage that wind would make up of the total Tier 1 resource? It doesn't look like they're all shown on this.

MR. KUGLER: They're not all shown, but I think the expectation is this is the bulk of them.

CHAIRMAN SPRITZER: Okay. I mean this may be --

MR. KUGLER: It looks like about one-fifth roughly.

CHAIRMAN SPRITZER: Okay. So one-fifth being 20 percent?

MR. KUGLER: Well, one-fifth of the 20 percent. So it would be about four percent. In other words, if the RPS is 20 and 20 percent and this is about one-fifth of that, it would mean about four percent.

CHAIRMAN SPRITZER: Of the total.

MR. KUGLER: Of the total, yes. About 20 percent of the renewables, yes.

CHAIRMAN SPRITZER: Looking back to Table 6 on Applicant's 10, the one with the 25 percent, I understood that 25 percent to be 25 percent of what would meet the RPS standard. Twenty-five percent of the total Tier 1 resources. Not 25 percent of the total.

MR. KUGLER: I believe you're right.

MS. CORT: Yes.

MR. KUGLER: So it's about one-quarter.

(Off the record discussion.)

CHAIRMAN SPRITZER: Whereas the figure you were giving from the table we were looking at in the other exhibit was about 20 percent.

MR. KUGLER: Roughly. I mean it's an estimate.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: But that's not a large difference.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: It would be somewhat less it seems like than this 25 percent case.

CHAIRMAN SPRITZER: So if we took again hypothetically 20 to 25 percent we assume that 20 to 25 percent -- Let me start again. If we assume that Tier 1 requirement in 2022 will be somewhere that wind power will make up somewhere between 20 and 25 percent of the Tier 1 resources that would satisfy the REC requirement in 2022.

And then we look at the offshore installed capacity needed to meet that, it's going to be -- Well, if it's 25 percent, it's going to be 975. Obviously less, somewhat less, if we're using 20 percent. Is that a fair estimate?

MR. KUGLER: That sounds -- Yes, I believe that's correct, sir. Probably -- Well, if we're using 20 percent, it would be probably around 800. Yes.

CHAIRMAN SPRITZER: Now I know you weren't looking at 2022 when you did the FEIS. But the amount

that would be -- Either of those two amounts that you've just given me would be larger than the amounts you were assuming for offshore wind in the FEIS. Is that correct?

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: I guess one thing that this would lead me to conclude -- and you can certainly disagree if you do -- is that the time we do the analysis, the date that we use for the analysis, may very well affect the outcome if we take the Maryland Renewable Portfolio Standard into account.

MR. KUGLER: Well, actually if we can go back to -- If we can go to page 9-3 of the Applicant's Exhibit 5, there's a figure toward the bottom of that page right there. I'm trying to figure out. We're doing math here kind of on the fly. But I'm trying to figure out why the numbers don't seem to be coming out right.

If you look at this figure, this is talking about the total amount of additions in megawatts. So that's the capacity that will have occurred. So it's a cumulative graph between 2010 and 2030. And if you look at that, it's talking about under 200 megawatts of wind.

So I'm having a difficult time reconciling

that number with the numbers in this other report.

CHAIRMAN SPRITZER: Well, we've been going for about an hour. Perhaps now would be a good time to take a ten minute break. We will not be going out for lunch. So hopefully in ten minutes.

And if you want you're more than welcome to take a look and maybe you could help us understand this a little better when we get back.

MR. KUGLER: Okay. Thank you, sir.

CHAIRMAN SPRITZER: Off the record.

(Whereupon, a short recess was taken.)

CHAIRMAN SPRITZER: On the record. What exhibit were we looking at?

MR. KUGLER: Well, we were looking between Applicant's Exhibit 5 and Applicant's Exhibit 10. I think we have been able to sort out what the difference is that we were struggling with.

In Exhibit 10 it talked about for the year 2022 over 13 million RECs being required to meet the RPS standard. So that's over 13 million megawatt hours of generation.

And yet in Exhibit 5 in Table 9.3 on page 9-5, it's only indicating RPS related generation of under 3 million megawatt hours. And the difference is that a very large percentage of the RPS is going to be

met by generation outside the State. As we talked about earlier, they can purchase RECs from anywhere essentially within the PJM region, PJM being one of the management regions for electric power in this country.

What this is telling us is that a very large percentage of the RECs that are purchased to meet the Renewable Portfolio Standard in Maryland will come from out-of-state. And then less than a quarter of them will come from in-state resources for these Tier 1 resources, the ones other than solar.

CHAIRMAN SPRITZER: Okay. Regardless though of where the generating capacity happens to be located, Maryland or somewhere else, are the numbers in Table 6 of Applicant Exhibit 10 within the ball park so to speak?

MR. KUGLER: If the RPS standard is met -- If 25 percent of the RPS standard is met with wind power, those would be approximate capacities that would be necessary. But the point would be that they might be somewhere else and not necessarily supplying any power to Maryland at all. Because again they can purchase the RECs. They are not purchasing the power.

CHAIRMAN SPRITZER: Okay. So we need somehow to integrate the information that was in the -

- Which table is it again?

MR. KUGLER: I think honestly the long term electricity report which is written by Maryland. It's a very recent report. It's Figure 9.3 shows the amount of generation.

But if we go back to Figure 9.1, I think there's a point to be made here. And that is that the State believes that it will have less than 200 megawatts of wind generation added between now and 2030. In our combination of energy alternatives, we actually gave credit for 250 to 300 megawatts of installed capacity.

The point I'm trying to make is that we're not short-selling these resources. We have tried to give as much credit as we felt we could to wind and solar. So we included a substantial amount of new installed capacity for these resources. And when you look at what the state expects to see happen we're in pretty reasonable alignment with them if not a little bit higher.

CHAIRMAN SPRITZER: I take it that there are a lot more additions of capacity for wind that will occur, but they'll be outside at least according to this document of Maryland.

MR. KUGLER: Well, not necessarily.

Maryland is not saying what resource will meet the RPS requirement for the RECs that are purchased from other states. It just has to be those Tier 1 resources. So it may or may not be wind. It's difficult to say how much of player wind will be in those numbers.

CHAIRMAN SPRITZER: So just looking at Figure 9.1 and again for some reason I can't remember -- This is NRC 5 I believe?

MR. KUGLER: It's actually Applicant's 5.

CHAIRMAN SPRITZER: Applicant's 5, okay. Figure 9.1, Applicant's 5, the blue which shows --

MR. KUGLER: Is wind.

CHAIRMAN SPRITZER: The blue part of the bar graph which shows wind, if I'm understanding that, it's talking about capacity additions only in Maryland.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: There could be additional capacity additions that contribute to meeting the RECs outside of Maryland.

MR. KUGLER: Yes, that's correct.

CHAIRMAN SPRITZER: And they could be used to generate, to provide, electricity to Maryland even though they might be located somewhere else.

MR. KUGLER: It's possible, but it's hard

to say. It depends on where the resources are.

CHAIRMAN SPRITZER: If we were to assume hypothetically that all the resources outside of Maryland are used to provide power in Maryland, what would be the number? What would be the total RPS capacity addition whether in Maryland or not?

MR. KUGLER: I'm not sure I have a number for that. Again in terms of the total Tier 1 resources it's roughly 20 percent or it's 20 percent of the generation in Maryland which the estimate in Applicant Exhibit 10 shows about 75 million megawatt hours in the year 2022, the last year that they were looking at. So roughly 15 million megawatt hours.

But what that converts to in terms of megawatts capacity really depends on what type of facility it is because they have different capacity factors. It's very difficult to try and convert that directly into a megawatt capacity number.

CHAIRMAN SPRITZER: Let me try and sum up and see if this helps us. Again, going back to Table 6 on Applicant's 10 and again assuming 25 percent, somewhere between 20 to 25 percent, of the 2022 REC obligation will be met with wind power. If I understand what you're telling me if we were to assume that was to be met with offshore installed capacity of

975 megawatts, a small percentage of that might be in Maryland, the rest outside of Maryland.

MR. KUGLER: Yes. Yes, Your Honor.

CHAIRMAN SPRITZER: And you in your FEIS limited as I understand it the additions to capacity that you were interested in for those in Maryland, physically located in Maryland or directly offshore or offshore of Maryland.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: So if it was offshore Delaware -- If a new capacity was offshore Delaware and used to satisfy the REC obligation for 2022, it wouldn't be part of your -- You wouldn't have included that in the combination alternative.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: Okay. I think I understand where we are. Okay. Going back to Applicant's 10 on page 22, I'm wondering if we can use these numbers to tell us where we would be in terms of solar power. I take it from what you told me earlier with solar power that's got to be physically located in Maryland in order to satisfy the REC obligation.

MR. KUGLER: That's correct.

CHAIRMAN SPRITZER: Let me ask one preliminary question that I should have covered

earlier. In the table, they're assuming a one percent growth per year in retail electricity sales.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: Is that a reasonable estimate in your view?

MR. KUGLER: I'm trying to think of other reports I've looked at. It's probably not an unreasonable number. I think other studies have shown a slightly larger number. But it's probably a reasonable number to use.

CHAIRMAN SPRITZER: If we were trying to calculate the requirement for solar capacity that would be necessary in 2022, I take it we'd start with the 75,916,526 megawatt hour number, multiply it by 0.02.

MR. KUGLER: Yes, Your Honor.

CHAIRMAN SPRITZER: And that would be the number of megawatt hours that whatever the capacity is would have to provide.

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

CHAIRMAN SPRITZER: Have you done -- Is there a way to translate from that number two percent of 75,916,526, derive that number and translate that back into a particular installed capacity?

MR. KUGLER: It can be done. I'm not sure

I can do it sitting here.

CHAIRMAN SPRITZER: All right.

MR. KUGLER: In round numbers, if for the sake of argument we use a capacity factor for solar of about 20 percent, most solar PV is less than that. Solar concentrating can be higher.

And just as an example one of the projects that's been discussed here is the installation at FedEX Field. And if you look at the numbers for that installation they're expecting a capacity factor of around 15 percent.

But if we use 20 percent we would have to take that roughly 1.5 million megawatt hours. I didn't bring a calculator with me.

CHAIRMAN SPRITZER: I do have one I think. Hold on.

(Off the record discussion.)

We do have one here if it will help. We have all these engineers here.

MR. KUGLER: I wasn't expecting to be doing calculations. All right. That's per year. That's about 1.5 million.

MR. WILSON: Your Honor, in the interest of efficiency, perhaps this is something we can supply to you at a later date.

CHAIRMAN SPRITZER: Well, I don't mean to make the witness spend more time on it than appropriate. But is this something you can do in a few minutes or is it going to take a long period of time?

MR. KUGLER: I think I can do it fairly quickly.

CHAIRMAN SPRITZER: Okay.

MR. KUGLER: I just want to check the number here. I mean just doing a quick calculation I'm getting something over 800 megawatts --

(Off the record comment.)

-- of installed capacity to fully meet the two percent. With that said, the State doesn't really expect that to happen. And this gets into that question that came up I think early on I think in the opening statements. There was some discussion of the staff doesn't expect the companies to meet the RPS standard. And that's not true.

But as I've indicated, these companies have options on how they meet that standard. And I believe it's -- Is it in the long term electricity report? I believe it is.

(Off the record discussion.)

If you could go to page 3-21 in

Applicant's Exhibit 5, the paragraph under the table. Okay. In this paragraph, the State discusses the solar portion of the RPS standard. And what they essentially say is that only by the year 2022 when they reach the full two percent they only expect about half of the solar requirement to actually be met by facilities built and that the balance will be met with these alternative compliance payments.

What they found and it's fairly consistent with what I've seen elsewhere is that the way the system is set up at some point these alternative compliance payments come down over time. And at some point they become less than the cost of actually building the facilities.

And at that point it's cheaper for the power company to pay the compliance payment rather than build the facility. And their expectation is -- and this is the State, this is not us -- that's exactly what's going to happen. They'll get to about half of the amount required by the RPS and that the balance will come from payments.

CHAIRMAN SPRITZER: So you gave me a figure just now of installed capacity of?

MR. KUGLER: Something over 800.

CHAIRMAN SPRITZER: And we multiply that

by 0.5.

MR. KUGLER: So about something over 400 by 2022.

CHAIRMAN SPRITZER: Okay. Let's look at NRC 4 and your direct testimony pages 33 through 36. But we'll start on page 33. Did you assume -- When I read this, I got the impression but tell me if I'm wrong -- that you assumed that enduser photovoltaics will contribute to some extent to the so-called combined alternative.

MR. KUGLER: Yes, Your Honor. At this point in this state it's unlikely and in fact it's discussed at the end of that page. We don't really foresee any concentrating solar at all in this state. So it's all going to be photovoltaic. A lot of it will be or most of it, if not all of it, will be enduse.

CHAIRMAN SPRITZER: Photovoltaic solar, is that basically panels that people install on their roof or carport or something like that?

MR. KUGLER: Or on land. There are -- The bigger facilities that are being built in this state, for instance, there's a 20 megawatt facility up in Hagerstown. There they're clearing ground and building a large 20 megawatt facility on the ground.

So it's going to be a mixture of those types of facilities and then the much smaller home-based rooftop installations.

CHAIRMAN SPRITZER: When you refer to enduser photovoltaics, is that assuming somebody whether it's a business or an individual who's using photovoltaics at least in part to generate electricity for their own use?

MR. KUGLER: That's correct, sir.

CHAIRMAN SPRITZER: As opposed to supplying it for the grid?

MR. KUGLER: Well, the way it typically works is to the extent that the system is supplying less power than they need they take all the power from the solar panels and then some power from the grid. There may be times when they're using less than the solar panels are generating at which point they will actually provide power to the grid.

CHAIRMAN SPRITZER: And is that why photovoltaics could be included in the combined alternative because they do at times generate or supply power to the grid?

MR. KUGLER: It's not so much because they supply power to the grid. But even when they're not supplying power to the grid they are offsetting a need

for power that the grid would have had to provide otherwise. So whichever way the power is going they are offsetting some of the generation that the grid would have had to provide.

CHAIRMAN SPRITZER: And is that a functional equivalent of base load power when the photovoltaics are supplying -- In other words, are they taking the place of base load power that would otherwise be required?

MR. KUGLER: No, Your Honor. Because they will operate in a very intermittent manner. Obviously, photovoltaics only provide power in daytime and when the sun is shining reasonably bright. The amount of energy you get drops fairly significantly when cloud covers the sun. And obviously at night you get nothing. So it's an intermittent source. It's not base load.

Now as long as the applications are relatively small compared to the grids capacity, the grid can absorb that. And it won't really even show up. It becomes more of an issue if you have very large penetrations into the grid by an intermittent source like solar. Then the grid operators have to figure out how to manage that.

CHAIRMAN SPRITZER: Would the photovoltaic

power that you assumed in the or used in the combined alternative, is that combined with a CAES plan in some way to produce base load power?

MR. KUGLER: We showed it as being coupled with CAES in order to make it look like base load power. It wouldn't necessarily have to be done that way. It could be backed up by something other than CAES. The reason we chose CAES was the environmental impacts are slightly smaller if you back it up with CAES than if, for instance, you back it up with natural gas plant.

CHAIRMAN SPRITZER: Are photovoltaics -- Do they ever come with their own device that you can use to provide constant power? For example, can they be used to recharge a battery?

MR. KUGLER: That's possible. It can be done. I'm sure it's been done somewhere. I don't think it's typically done with home installations. I don't -- I'm not aware of any of the larger ones that we've looked at having any sort of storage like that. But it can be done.

CHAIRMAN SPRITZER: To what level did you make an assumption in the FEIS about the installed capacity of these photovoltaic units?

MR. KUGLER: What we did in the FEIS was

assume a base load equivalent power level of 75 megawatts. And depending on the capacity factor you use would indicate how much actual installed capacity you would need.

In our testimony we talked about giving it a generous capacity factor of 25 percent which is probably too high. But if you use 25 percent capacity factor that 75 megawatts capacity of average generation will convert to about 300 megawatts of installed capacity. If you use a smaller capacity factor, it means larger installed capacities.

CHAIRMAN SPRITZER: Okay. Let me just take a quick look through my notes and see if there's anything I left out. And at that point I'll turn you over to my colleagues. Why don't you go ahead? I don't have anything else. Thank you.

JUDGE ARNOLD: Thankfully my list of questions have been considerably whittled down by Judge Spritzer. On Intervenors in their testimony they state "Applicants and NRC staff have consistently understated the potential contributions of solar and wind power to Maryland and the larger PJM grid." To your knowledge, in the FEIS does it ever state what the offshore wind potential is in Maryland? I ask because I couldn't find it.

MR. KUGLER: I'm trying to recall if we specifically stated the offshore capacity. I know we referenced the report by the National Renewal Energy Lab and I know we looked at that. But again our focus really was more on what is likely to be installed than what is theoretically available offshore.

I know in our testimony we did specifically state it. I believe that was in Answer 33 which is on page 27 of our testimony. So that would be NRC 4. So page 27, Answer 33, we indicate for the Mid-Atlantic Region, the Mid-Atlantic Region from New Jersey to North Carolina has up to 570 gigawatts of potential offshore wind capacity and about 54 gigawatts is attributable to Maryland.

Let's see.

(Off the record comments.)

But looking at the environmental impact statement, no, it doesn't appear that we ever stated an offshore potential.

JUDGE ARNOLD: Does the environmental impact statement mention how much solar power potential exists in Maryland?

MR. KUGLER: No, Your Honor.

JUDGE ARNOLD: The FEIS on page 9-23 states that "Utility scaled solar projects typically

require five to ten acres for every megawatt of generating capacity." Is that for an installed megawatt capacity?

MR. KUGLER: Yes, Your Honor.

JUDGE ARNOLD: Okay. So at a 15 percent capacity factor that would be something like 33 to 67 acres per actual average megawatt?

MR. KUGLER: That sounds about right. Yes, sir.

JUDGE ARNOLD: Andy, could you put up the Table 9-4? Okay. And that is Table 9-4 from the EIS. I pulled it out so you didn't have to go searching for it.

MR. WELKIE: Is that the one you pulled out? Yes.

JUDGE ARNOLD: Now this is a comparison between the four reasonable alternatives that you evaluated against the various types of environmental impacts. Correct?

MR. KUGLER: Yes, Your Honor.

JUDGE ARNOLD: And the combination of alternatives in the righthand column, that's the combination we're talking about, 100 megawatts wind, 75 of solar, etc.?

MR. KUGLER: Yes, Your Honor.

JUDGE ARNOLD: Could you point out in this table what specifically are the impacts that made you say that the combination is not preferable to nuclear?

MR. KUGLER: Well, there are three basic differences between them. The land use impacts are greater for the combination of energy alternatives as are the air quality impacts and the waste management impacts.

Now not all of that is related to wind or solar. Some of it relates -- If you go back to Table 9-3, we talk a bit about what's behind those impact categories. So we talk about, for instance, in land use you have impacts from the natural gas plant, wind, solar, hydro, biomass and transmission lines which would all affect land use. So it's a number of things in that area.

In terms of air quality, it's primarily the natural gas plant, although biomass generation also has emissions. And then in waste management it's basically some of the waste that comes from the natural gas plants, biomass and municipal solid waste. So those are the main differences between those.

JUDGE ARNOLD: Okay. Looking at those three items for the combination of alternatives, without considering whether it's reasonable or not, if

you just increase the contribution of solar and wind to that, in which direction do those three impacts go? Do they improve or get more severe?

MR. KUGLER: Okay.

JUDGE ARNOLD: Start with land use.

MR. KUGLER: Starting with land use, if you increase your wind and solar, in general you're going to increase the land use impacts. While the gas plant will start to get smaller, you eventually eliminate one unit, another unit perhaps. They have a relatively small footprint to begin with.

But as you start increasing the wind and solar, a couple of things are going to happen. First of all, the facilities themselves take up a fair bit of space depending on exactly where they're set up. In addition, you'll probably have to run more transmission because you're going to start having distributed sources of power and you have to be able to move the power from those sources to the load centers that are using them.

In terms of air quality, as you shrink the natural gas plant, obviously wind and solar don't have any significant impacts on air quality. So as you make the gas plant smaller and smaller eventually you would get to the point where those impacts would

become small.

In terms of waste management, those impacts should also gradually decrease, although you still have the biomass and municipal solid waste contributing to that.

But the land use probably becomes the biggest issue. Because as you have already I think figured out because of low capacity factors, particularly for solar but also for wind, you end up having to install very large nameplate capacities in order to match these kinds of power outputs. And so you're going to start affecting very large areas of land.

Now some of the solar you may be able to do on rooftops which reduces that impact somewhat. But what we're seeing at least here in Maryland and I think elsewhere in the country is that the larger installations are not being done on rooftops but on the ground. And they will have impacts.

JUDGE ARNOLD: Once again, putting aside whether or not it's reasonable, say we can increase the solar contribution and the wind contribution. Is there ever a point at which that becomes environmentally preferable as compared to nuclear?

MR. KUGLER: Looking at the table, I think

the answer has to be no. I think you get a lot -- You could get closer in that your air qualify impacts could become similar, your waste impacts may become similar. But your land use impacts continue to increase. And so it would always be greater than nuclear. And it doesn't end up being better than nuclear and any of the other categories.

I'm sorry. Let me make -- No, that's still correct because water use and quality were small already. So you can't make it smaller than small.

JUDGE ARNOLD: Really all of the exercise in determining what's reasonable wasn't really essential to this environmental determination.

MR. KUGLER: Well, I think it's important that we develop a combination of energy alternatives that we think could be done to compare it to what's been proposed. Because until we do the comparison, we don't know for sure how it's going to come out.

JUDGE ARNOLD: That finishes my questioning.

JUDGE SAGER: I guess it's my turn. Witnesses will be happy to hear that my list of questions has gotten even smaller. I have to try to pick through the detritus of all my lists here and see what I can find.

Let me ask sort of a dumb question. Who defines the purpose of the project?

MR. KUGLER: We do. The NRC defines the purpose and need.

JUDGE SAGER: And that's standard. And does the NRC ever say that purpose is not reasonable?

MR. KUGLER: Are you saying do we say is that the applicant's purpose is not reasonable?

JUDGE SAGER: Perhaps I'm being too obtuse. The Intervenors have said that the purpose is no longer valid. Does NRC ever look at the purpose and say that's not valid?

MR. KUGLER: Well, I guess we could if we find that. I can only really speak to this specific case. But the approach we took -- Obviously, the Applicant said, "We're looking to build a big base load plant."

JUDGE SAGER: Yes.

MR. KUGLER: Okay. So we do consider that. That's the proposal before us. But we also look to see what the State had to say about it and the State in reviewing the Certificate of Public Convenience and Necessity took a hard look at this proposal.

And in their view the building of a large

base load facility within Maryland was very important. And that was a large part of the basis for their approval of that certificate. So based on the fact that the State said, "Yes, we need base load generation here and we need a lot of it" we felt that that was a reasonable purpose and need to include in our environmental impact statement.

JUDGE SAGER: Okay. Thank you. So I have a couple of questions that all get at the question of how independent is your analysis relative to the Applicant's because the numbers comes out being the same. So I assume -- Well, maybe I shouldn't make any assumption.

Do you take the Applicant's analysis and then say, "Yes, that's okay"? Or do you perform an independent analysis? How independent are these two analyses?

MR. KUGLER: We take a look at what they submit to us, but we do our own independent work. We go and look at what the DOE is saying. We look at what the State is saying. I mean their information is a starting point, but it's clearly not our endpoint. We do our own work.

I'm trying to recall this case. I'll be honest. I don't remember what the ER said for the

combination of energy alternatives or if they even had one. Because again we just start from what they have to say, but we then go on and do our own work. So I'm not sure I could remember. I don't think I even have the ER here with me.

JUDGE SAGER: Okay. A minute please. I'm having to scroll through the document. Well, I had one question and I'm not sure it's a good one. But it goes into another one that I thought of while we were listening. It's sort of to the idea about the role of the CAES combined. What is that, compressed air energy storage basically.

That seems to be in the analysis a big limitation to how much wind energy or solar energy can be used for base load. How dependent is your analysis on that? And we kind of got at that question a little bit by asking about can you vary the amount of gas power supplied.

Let me stop and let you answer. And then I'll pile on.

MR. KUGLER: Okay. Honestly, the use of CAES was not critical to how much wind or solar we included. We determined how much wind or solar we were going to include based on the projections of DOE and the State and then said, "Okay. Once we have that

might, how do we make up for the intermittent nature of these resources"? And then we included some CAES to do that.

In our I believe rebuttal testimony, we spoke to -- And I don't know if we could pull that up, the staff's rebuttal testimony. I don't know what number that is.

MS. CORT: It's 43, NRC 43.

MR. KUGLER: So NRC 43.

(Off the record discussion.)

Okay. On page 15. Actually, I think we want to go to -- Actually, go to page 16. I'm sorry. And in this middle paragraph on this page we talked a bit about what if. If we didn't use CAES at all, what would that mean?

Well, as we talked about a little bit earlier, there are other ways to deal with the intermittent nature of wind and solar. And one way would be to have natural gas powered plants as backing it up. That's maybe actually a simpler solution, but it has somewhat greater environmental impacts than CAES would have because all of the power is then coming from burning natural gas. Whereas in the CAES plant some of the power is coming from the energy of the stored air.

We used CAES in order to try and again minimize the impacts as far as we could on the environment. But if we had not used CAES and if we had used just natural gas to back it up instead which would be the most likely source it wouldn't have made any significant difference.

JUDGE SAGER: Right, but as I read it, it seemed as if -- see if this is a correct statement -- that by doing that it allows you to use a fixed number for the natural gas power plant and 900 megawatts or 1200 megawatts as I remember. Whereas, we asked previously do you have an intermittent or have a variable wind energy production from your wind and solar that could be filled in by a variable natural gas.

MR. KUGLER: Right. If we did away with CAES and we took that out of the picture what we would probably -- what I assume we would have done then instead would have been to say, "Okay. We will build a 1375 megawatt natural gas plant of which 1200 megawatts would run as base load and 175 megawatts will cycle up and down with the wind and solar."

JUDGE SAGER: But the 175 megawatts wasn't based -- Was that based on the CAES limitation? Or that was based on other estimates?

MR. KUGLER: No, the 100 megawatts of wind and the 75 megawatts of solar were based on projections from the State and from DOE. And then the CAES was added on really at the back end.

JUDGE SAGER: Okay. So another kind of question in a similar vein was I believe the Intervenors have said that the whole idea of base load has changed because you can bring together distributed renewables over a large area and in effect have enough power that you don't have to worry about running out. Is that a reasonable scenario?

MR. KUGLER: I don't believe that it is. It's a theoretically possible scenario. It would be very expensive. And I don't think we have seen it done in this country.

To do what -- To take that approach, what you would do is say, "Okay. I need" -- pick a number -- "let's say 400 megawatts from wind." But wind doesn't always flow steadily in one place. So I'm going to put wind turbines in many different locations in the hope that there's always wind blowing in some of those locations and I can get 400 megawatts steadily out of it.

You're going to have to build a lot of wind turbines to do that, spread it over a large area

with their transmission lines. The costs, both environmental and monetary, of taking that approach will be very high. And you will still need to make sure you've got some other backup power source because there will be days when the wind is just not blowing in any of those places. That's just the way the weather works.

And solar is sort of similar. We know the sun comes up every day. So we've at least got that. But there are cloudy days like earlier today. You're not going to get a lot out of your solar at that time even though the sun is up.

So you're still going to have to back it up with something else. And it gets very expensive to do all that. And I think that's one of the reasons we've really struggled to get large quantities of renewables particularly in the eastern part of the United States. Solar in particular and in some places wind has come in in a fairly big way in some places where those resources are really good.

JUDGE SAGER: In your earlier testimony, you mentioned about the current grid runs into problems of getting energy from one place to another. So the idea that the wind is always blowing somewhere maybe it's blowing in Texas and you needed the energy

up here. Can the present day grid handle that kind of transfer of energy?

MR. KUGLER: Not those kind of distances. The line losses would be much too high. Generally, you're wielding power within a region. And one of the challenges facing Maryland right now is that we import so much of our electricity that the transmission lines coming into the state at peak periods are really congested.

And it's a big concern. That's one of the things the Public Service Commission is very concerned about.

JUDGE SAGER: Okay. Give me a minute please. Let's see how to say this. It appears that your analysis of what is feasible is based largely on some documents like what DOE -- I forget what.

MR. KUGLER: Annual Energy Outlook.

JUDGE SAGER: Right. What they have put out. Those seem like they might be conservative. I don't know whether that's true or not. You've probably seen other estimates from other entities projecting future wind and solar power.

Do you have a feeling for how conservative DOE is as compared to the others? Is this on the low end?

MR. KUGLER: I think what I see DOE doing is they're trying to project what they think is likely to occur. I don't know that they're necessarily being conservative as in low values. They're really trying to take all the data they've gotten, look at what's actually happening and project out what is likely to occur down the road.

There were so many factors that affect what will actually occur five or ten years from now. It's a very difficult thing to try and project. But I think what they do is fairly reasonable.

There are a number of reports you can find that say -- One of the Intervenors' documents said I think that Maryland could get 40 percent of its energy easily from renewables. Again, what that report is saying is in theory if we maximize everything this is what we could do. And then if we use offshore wind it said we could get over 100 percent. We could get all of our energy from renewables and we don't need anything else.

I think what I've seen is a lot of those reports take a somewhat simplistic approach and ignore factors like with all the variability in some of these resources how does your grid manage this power and how much grid are you going to have to build to do it.

Because a lot of the renewables in order to make them work need a lot of grid work to support them.

One of the big problems facing Texas right now is they have enormous wind resources in the west, not much in the east and they can't always get the power even when it's available in the west, they can't always get all of it to the east. They just don't have the transmission capacity.

So there are challenges associated with these scenarios that you really have to take into account. And I think DOE tries to be realistic in their projections.

MS. CORT: And if I could just add. I wouldn't characterize necessarily particularly with regard to the renewable projections from DOE. I would not characterize them as being conservative. If you look at the projections that they have out there from the AEO 2010-2011 they're looking at over 70 percent growth in electricity generation from these renewable sources.

And if anything over the years what they've probably been doing is over estimating. You'll see back to the AEO 2009-2010-2011 they're kind of scaled back as some of these planned generation facilities have not come into fruition. They have

scaled back. So I wouldn't characterize it as being conservative.

JUDGE SAGER: Thank you. Let me see. Okay. One final question. This comes from page 10 of the staff rebuttal document. You don't need to go look it up because I'll tell you the -- The phrase is "There is no NEPA requirement to use the best scientific methodology." It seems like a statement of mediocrity. How defensible do you think your scientific methodology is?

MR. KUGLER: Well, I believe the method you use is very defensive. I think our intention is to use the best information available. I think what the statement is saying is that NEPA doesn't require you to do that. It doesn't require extreme precision especially when you're starting to talk out into the future. So I think that was really the intention in that statement.

But obviously our approach is to use the very best information we can find to develop the environment impact statement and the alternatives.

JUDGE SAGER: Thank you. I'm done, Judge Spritzer.

CHAIRMAN SPRITZER: I just found one thing in my notes that I forgot to ask you. Could you go to

page 26 of NRC 4, your direct testimony? I believe it's paragraph A-32 and toward the middle again. "The MPSC" -- I think that's Maryland Public Service Commission -- "considered the potential for wind power in Maryland in the 2008 report and concluded the economic benefits for renewables remain uncertain and challenging." Do you know what they meant by "economic benefits"?

MR. KUGLER: They're basically saying that the net economic benefit or the recovery of cost for renewables was borderline. As we go on, it says, "Onshore wind yield net economic benefits albeit on the small scale" so that you come out slightly ahead on cost for onshore wind, but that offshore wind does not yield economic benefits. They're saying that it basically costs too much to build and operate offshore wind compared to what you're going to get in return.

CHAIRMAN SPRITZER: They're talking I take it about economic benefits to the owner of the generated unit.

MR. KUGLER: I believe that's correct. I believe that was their intention.

E CHAIRMAN SPRITZER: Essentially profit is either going to make a profit or --

MR. KUGLER: Yes, that's correct. And of

course that drives the decision what to build.

CHAIRMAN SPRITZER: Was that a factor in your analysis of how much wind and solar to go into the combined alternative?

MR. KUGLER: I think as Ms. Cort spoke about earlier indirectly yes. We don't directly consider cost unless an alternative is environmentally preferable. But it is a factor that shows up in the background of the projections that we use. So cost is considered by those people working on the projections. And so it is implicitly then within the projections that we're using.

CHAIRMAN SPRITZER: All right. I don't think I have anything further. And I take it my colleagues are finished. So much to your dismay I'm sure we are about finished with you.

Our next step would have been to ask the counsel here to take a 15 minute break and let counsel prepare any rebuttal questions if they have any. Can you tell me? Do you expect to have any rebuttal questions?

MR. SMITH: I don't believe we have any rebuttal questions at this point.

CHAIRMAN SPRITZER: NRC staff?

MR. WILSON: No, Your Honor.

CHAIRMAN SPRITZER: Again, Mr. Mariotte, I have to come back to you. Do we have any word about our witness of interest?

MR. MARIOTTE: We tried to call him during the last break and did not reach him.

CHAIRMAN SPRITZER: All right. I suppose then we'll proceed --

MR. MARIOTTE: We'll try again at the next break.

CHAIRMAN SPRITZER: Well, why don't we take a five minute break and you call him again now.

MR. MARIOTTE: We will certainly give it a try, Your Honor.

CHAIRMAN SPRITZER: Okay. Off the record.

(Whereupon, a short recess was taken.)

CHAIRMAN SPRITZER: On the record.

MR. MARIOTTE: I have him on the phone now. He's just landed. He is available tomorrow.

CHAIRMAN SPRITZER: But can he definitely be here tomorrow? I'm not going to keep us and other parties waiting tomorrow.

MR. MARIOTTE: He will definitely be here.

CHAIRMAN SPRITZER: At 9:30 a.m.

MR. SMITH: Would it be possible to start earlier tomorrow?

PARTICIPANT: It will be okay with me.

CHAIRMAN SPRITZER: What time would you like? What?

MR. WELKIE: The building doesn't open until 8:30 a.m.

CHAIRMAN SPRITZER: Okay.

(Off the record discussion.)

MR. MARIOTTE: Your Honor, yes. He says he will be here at 9:30 a.m. tomorrow morning. And I really apologize. I'm more dismayed than you are I think.

CHAIRMAN SPRITZER: I take it that we will proceed with the Applicant's witnesses, although I'll give you the option since the original plan was that you would go last and have a chance to respond to his testimony. Do you want to proceed with your witnesses now?

MR. SMITH: I think our witnesses are here and they're available and we've been listening all day. And we think we're certainly prepared to continue today.

CHAIRMAN SPRITZER: Okay. Unless people need to take a break, I guess we can get started with a few witnesses and get them out of here in a reasonable hour.

MR. WILSON: Your Honor, a bit of housekeeping. NRC staff. Our witnesses are scheduled to fly out tomorrow at some point. And we're trying to figure out if we need to hold them over or if we're going to go beyond 2:00 p.m. tomorrow.

CHAIRMAN SPRITZER: I would hope we'd be out of here by 2:00 p.m. I can't give anybody an absolute guarantee. I guess we have closing arguments as well as Mr. Sklar. We'll certainly try put it that way. We won't be going out to lunch.

(Laughter.)

MR. WILSON: Thank you, Your Honor.

(Off the record discussion.)

CHAIRMAN SPRITZER: I don't know if that gives you a good enough answer or not. All I can tell you we'll try. We'll do our best. I'm reasonably optimistic we'll be able to make it.

MR. WILSON: That's helpful. Thank you.

MR. SMITH: And certainly from our perspective we're willing to stay as late as necessary tonight to, for instance, get through our witnesses.

CHAIRMAN SPRITZER: I think we'll finish without any problem. We have the room until 6:30 p.m. But I hope we're not going to stay that long.

(Off the record discussion.)

Before we start with the Applicant's witnesses, Mr. Mariotte, I would like to ask you if you're going to prepare any rebuttal questions for the staff witnesses.

MR. MARIOTTE: No, we have no rebuttal questions. Thank you.

CHAIRMAN SPRITZER: I think I've asked everybody now. I think the State has no questions for the witnesses either.

Good afternoon, gentlemen. I remind you you're still under oath. My colleague, Mr. Arnold will start the questioning.

JUDGE ARNOLD: First, could each one of your introduce yourself so I know who is who? Starting on your right.

MR. RATTI: I'm Stefano Ratti.

MR. LUTCHENKOV: Dimitri Lutchenkov.

MR. VAN DER LINDEN: Septimus van der Linden.

JUDGE ARNOLD: My first few questions I believe are the appropriate person for me to ask is Mr. Lutchenkov. Is that correct?

MR. LUTCHENKOV: Yes.

JUDGE ARNOLD: Would you agree that the amount of wind power available in Maryland is greater

than the 100 megawatts considered in the EIS?

MR. LUTCHENKOV: No, I would not agree. That it's greater than?

JUDGE ARNOLD: That the amount of wind power available is greater than 100 megawatts.

MR. LUTCHENKOV: Excuse me. Yes.

JUDGE ARNOLD: Would you agree that the amount of solar power that could be available in Maryland is greater than the 75 megawatts considered in the environmental impact statement?

MR. LUTCHENKOV: Yes.

JUDGE ARNOLD: Is there any, to your knowledge, UniStar Environmental documents stating that the potential for wind energy in Maryland is only 100 megawatts or that the potential for solar energy in Maryland is 75 megawatts?

MR. LUTCHENKOV: Not to my knowledge.

JUDGE ARNOLD: Does UniStar own or operate any wind or solar power businesses?

MR. LUTCHENKOV: We do not.

JUDGE ARNOLD: If a license to build Calvert Cliffs 3 were not granted, would UniStar consider building solar or wind power plants instead?

MR. LUTCHENKOV: I really can't answer that. But we are a nuclear generating company at this

point developing nuclear power.

JUDGE ARNOLD: If there were to be either solar or wind facilities built instead of Calvert Cliffs 3 and they were to be ready in the time frame that Calvert Cliffs 3 is planned, would they have to at least be in the planning stages by now? I mean, how quickly can you build from a dead stop, get up and build 1600 megawatts of solar or wind power?

MR. LUTCHENKOV: If I can defer to Mr. Ratti. I think he's better.

JUDGE ARNOLD: Okay.

MR. RATTI: Yes, it would be possible to begin building a solar plant today that is not announced yet and be done before the completion of Calvert Cliffs.

JUDGE ARNOLD: Okay. And that would include all the permitting?

MR. RATTI: That would include potentially with the exception of offshore wind. But for onshore wind and solar I would say that would be possible.

JUDGE ARNOLD: Thank you. Your Exhibit 5, let's see, that's the long term energy report from Maryland. And not all of us are intimately familiar with that. So I've got a few questions about it. Who prepares that report?

MR. RATTI: I believe that was prepared by a panel of experts and consulting firms on behalf of the Maryland Department of Natural Resources.

JUDGE ARNOLD: Okay. And they are experts in forecasting electricity supplies.

MR. LUTCHENKOV: That is our understanding.

JUDGE ARNOLD: Okay. Is this a periodic report or was it just a one time thing?

MR. RATTI: I think it was a one time thing. I think it was at the request of the Governor I believe.

JUDGE ARNOLD: What is your understanding of the reference case in the report? What is the intent of the reference case?

MR. RATTI: My understanding of the reference case would be that is the scenario that could be expected in terms of an electricity mix going forward.

JUDGE ARNOLD: Okay. And that means if nothing changes this is what we would realistically project is going to happen.

MR. RATTI: Based on what we know today, yes.

JUDGE ARNOLD: Okay. Now the report also

contains a high renewable scenario. Do you know how that differs from the reference case?

MR. RATTI: It is different in that it assumes a higher percentage of renewables would be included in the Renewable Portfolio Standard. I believe it goes from 20 percent to 30 percent. And so as a result of that there would be higher amount of renewable generating capacity being installed.

JUDGE ARNOLD: Do you know? Does it try to bound the maximum possible that might happen? Or is it just a sensitivity? What would it look like if there was more?

MR. RATTI: I don't know for sure. I believe that's the case that it's a bounding analysis. There is also somewhere in the report also a mid case which is in between the base case and the high case renewable scenario. So it could be construed as a sensitivity analysis.

JUDGE ARNOLD: The report submitted into evidence was actually labeled a Draft Final Long Term Electricity Report for Maryland. To what extent does the draft nature affect its reliability?

MR. RATTI: I believe this was pretty extensively studied. So the draft has been around for a bit for over a year. So I would think that's pretty

close to final. But again I can't say for sure. Okay.

JUDGE ARNOLD: Mr. Van Der Linden, I understand you're the person to ask questions about the CAES.

MR. VAN DER LINDEN: Correct.

JUDGE ARNOLD: If a combination of power sources relies upon a CAES facility of significant capacity in Maryland in order to produce base load power, would you consider that alternative to be reasonable?

MR. VAN DER LINDEN: It will be reasonable if you could build a case plant under the situation in Maryland which has certain geological conditions that are not suitable.

JUDGE ARNOLD: Okay. So it's unlikely.

MR. VAN DER LINDEN: That's unlikely, yes.

JUDGE ARNOLD: Are there any other large energy storage capabilities that could be developed in Maryland in the time frame of interest?

MR. VAN DER LINDEN: Not that I'm aware of.

JUDGE ARNOLD: In Answer 52 of your direct testimony, you state "The basic objective of the utility scale storage of electricity is to store

access energy or energy with low production costs produced during off-demand periods and to use the energy at a later date to generate power during periods of high demand." Do you recall that statement?

MR. VAN DER LINDEN: Yes, I do.

JUDGE ARNOLD: Okay. I want to explore that concept first with solar power. Now solar power as I understand it is produced predominantly during the daytime.

MR. VAN DER LINDEN: Right.

JUDGE ARNOLD: So if you combine it with CAES what you would be able to do then is take solar power produced during the day and sell it at night.

MR. VAN DER LINDEN: You could do that. If you can do Hughes case, yes.

JUDGE ARNOLD: Okay. Now is there excess solar power capability available or likely to be available in Maryland in the near future?

MR. VAN DER LINDEN: I'd defer that to Mr. Ratti.

MR. RATTI: The question is if there's excess solar capacity available in Maryland in the future. I'm not sure I understand what you mean by that.

JUDGE ARNOLD: Well, in the definition that Mr. Van Der Linden had for combining CAES or energy storage with a power production was you use excess energy or energy with low production cost produced during off-demand periods and what I'm trying to do is determine if solar power fits that definition.

MR. RATTI: I think solar power because of the nature of the resource tends to be producing power during the times of higher demand. So I would believe that it would be likely to be the case. I think more what he's referring to here may be the case of wind where in which case wind tends to blow at night or during periods of lower demand.

MR. VAN DER LINDEN: Or other energy sources, you know.

JUDGE ARNOLD: Yes. So in your opinion does it make sense, economic sense, to combine solar power with any type of storage in order to make it into base load?

MR. VAN DER LINDEN: Not really.

JUDGE ARNOLD: Okay. If I understand it correctly, what you're doing is taking power from when it's needed.

MR. VAN DER LINDEN: Yes.

JUDGE ARNOLD: Storing it and then providing it later when you can get less money for it.

MR. VAN DER LINDEN: If you can manage bulk energy storage this is what we're really talking about. Then that does make sense if it's possible.

JUDGE ARNOLD: My impression is that combining wind power with CAES makes a little bit more sense in that -- Correct me if I'm wrong, but the impression I've gotten from reading exhibits is that wind power is typically more available at the nighttime and off-peak times as opposed to during the middle of the day.

MR. VAN DER LINDEN: That's correct.

JUDGE ARNOLD: So combining wind with CAES allows you to take energy produced at night, store it, convert it back into electricity during the day and sell it at a higher price.

MR. VAN DER LINDEN: That's correct because what you're doing is you're using spill damage here because you can't use it at night. And you would store it and then you'd dispatch it as capacity on the demand cycle during the day. That's again on the premise that you can store it.

JUDGE ARNOLD: Yes. Now that to me doesn't sound like base load power. That sounds like

peaking power or load following.

MR. VAN DER LINDEN: That's correct. It's more like what we would call mid-range or mid-merit power. And this is what the MISO system as examined may find that to be very useful. They had a lovely storage facility. As I testified the project was cancelled because of porosity of the sandstone was not adequate. So you run into those risks as well.

JUDGE ARNOLD: I'm just looking at it and it doesn't make economic sense to combine solar and CAES. And if you combine wind with CAES, then you're following the load. You're not being base load. So is there any situation that you can conceive of where you would combine solar and wind and CAES to make base load power that makes economic sense?

MR. VAN DER LINDEN: No.

JUDGE ARNOLD: Okay.

Now we're back to Mr. Ratti.

MR. RATTI: Yes.

JUDGE ARNOLD: In Answer A-42 of your direct testimony, you state "In 2010 the typical cost of utility scale photovoltaic plants was approximately 3,400 per kilowatt down from 8,000 per kilowatt in 2004." Do you recall this statement?

MR. RATTI: Yes, I do. I have it in front

of me.

JUDGE ARNOLD: Okay. Do those figures -- Are they for installed kilowatt or an average kilowatt production capability?

MR. RATTI: These are per installed kilowatt.

JUDGE ARNOLD: Okay. So at a 15 percent capacity factor that would be more in the neighborhood of 22,000 to 23,000 per kilowatt of available power.

MR. RATTI: That's correct.

JUDGE ARNOLD: And to make this into a base load supply would require some sort of storage facility in addition. Right?

MR. RATTI: Yes.

JUDGE ARNOLD: So per kilowatt of capability it's 22,000/23,000 plus some storage cost.

MR. RATTI: Correct.

JUDGE ARNOLD: Would that be an economically advantageous system?

MR. RATTI: It would not be economically advantageous.

JUDGE ARNOLD: I've heard the term "two percent carveout of the RPS" mentioned several times and I really -- This is the first time I've had contact with that term. So could you explain what

exactly carveout is?

MR. RATTI: Yes, a carveout is a part of the renewal portfolio standard that is targeted towards a specific technology. So by carveout it means a specific technology.

In this case, it is solar. So the State of Maryland requires that two percent of the electricity used in Maryland comes from solar power specifically. So that's why it's carved out from the remaining 18 percent.

JUDGE ARNOLD: Are there other carveouts or is this -- in the RPS?

MR. RATTI: This is the only one for Maryland. The use of carveouts is pretty common in the United States in other states. But for Maryland this is the only one.

JUDGE ARNOLD: Okay. Are these carveouts in terms of production capability or of the amount of electricity produced?

MR. RATTI: It's in terms of the amount of electricity produced.

JUDGE ARNOLD: Let's assume for a moment that there are no financial incentives to build solar power and there are no state or federal mandate to do so. Under that condition, what do you see as the

prospects for solar power in Maryland over the next dozen years?

MR. RATTI: Under those conditions, I would expect really no solar power to be deployed in Maryland.

JUDGE ARNOLD: And these financial incentives that do exist they don't actually reduce the cost of it. It just distributes the costs among the population.

MR. RATTI: Yes. It may be a little bit more complicated than that. But it is true that they do not reduce the cost, but what they do is they help the power producer offset the cost of producing solar power so that effectively they can sell it at a lower price than what it cost them to produce.

And these incentives are a mix of federal incentives such as the Investment Tax Credit and then state incentives. And obviously a large part of the benefit here comes from the Solar Renewable Energy Certificates which is the certificates that you can sell for complying with the solar carveout.

JUDGE ARNOLD: Okay. That's the end of my questions.

JUDGE SAGER: Okay. Let me see what -- So getting back to the purpose of the project the

Applicant has to decide on what the purpose is. Why provide 1600 megawatts of base load power? Where did UniStar come up with that idea that that is why they wanted to make this the purpose of the application?

MR. LUTCHENKOV: The EPR design is a 1600 megawatt.

JUDGE SAGER: Okay. I didn't specifically mean -- I was trying to get at this whole question of what is the purpose of building a power plant and whether it is still reasonable to say is base load power a reasonable concept. So maybe that's a better question for me to ask you. Is base load power still a valid concept?

MR. LUTCHENKOV: Yes, it is.

JUDGE SAGER: Okay. Can you elaborate?

MR. LUTCHENKOV: Yes. There is a baseline of power needed for if you want to call it background demand. And that is decided upon and constantly adjusted really based on the demand profile of the region of interest.

And in this case the idea is to have a base load power threshold at which the generator or generating units because the actual base load power required across the region is different than for each generator. A generator provides a constant amount

continuously of generation for long periods of time. And what is intended to do is that the minimum load and then you add on top of that peakers and mid-range units to provide the peak loads. There are sometimes peaks, sometimes valleys. So the base load is something that is there constantly and the generators provide that constant capacity.

JUDGE SAGER: Okay. Forgetting for a moment that it may be uneconomic right now to build renewables instead of a nuclear power plant, but suppose you had virtually unlimited renewable wind and solar. Would it be feasible to use that instead of a base load nuclear plant?

MR. LUTCHENKOV: When looking at the region of interest my understanding is it is not because of the distribution problems and challenges as well as the intermittent nature of those renewals.

JUDGE SAGER: Okay. Thank you. I guess your application contains I guess in the environmental report an analysis of renewable energy and what was the basis of your determination or what's reasonably foreseeable?

MR. LUTCHENKOV: The information provided from the reference sources that we used I don't have them on top of my head, but they're all listed and

input from subject matter experts who understand those particular technologies and the environment.

JUDGE SAGER: Okay. I guess I was trying to get at what your source was. But if you don't have that, let me move on.

MR. LUTCHENKOV: Well, I can --

JUDGE SAGER: For example, the staff used the DOE Energy EIA.

MR. RATTI: Yes, in the testimony here, we relied pretty heavily on the Long Term Electricity Report for Maryland which we discussed before and effectively looking at what the RPS requirements are. And so that's what we could expect the amount of renewable energy to be deployed in Maryland over the next 10 to 15 years. So we took a slightly different approach than what the staff's witnesses have talked about. But we ultimately come to a similar conclusion.

JUDGE SAGER: Okay. This comes from page 17 of the initial statement. But I think it may be attributed to Mr. Ratti. Bluewater is unlikely to put it into service for some time. Can you comment on how long that might be and why is it going to take so long? I guess we're speaking about the Maryland Whitewater 600 megawatts power.

MR. RATTI: The Maryland Bluewater, not the one in Delaware.

JUDGE SAGER: No, I'm talking about specifically the one in Maryland.

MR. RATTI: Okay. There is no requirement to date to build offshore wind in Maryland. So there's no offshore wind carveout. So when you look at the economics of the different renewable energy resources, offshore wind tends to be among the renewable energy resources the most expensive or at least close to the most expensive.

So one would expect that if there is a requirement to build renewable energy there will be other ways to fulfill that requirement before you get to build offshore wind unless again there was a specific carveout. They would be obligate utilities to purchase renewable energy from offshore wind in which case that will be different. But that's not the case today.

JUDGE SAGER: But presumably NRG Bluewater had some reason for proposing to make a 600 megawatt offshore plant.

MR. RATTI: Yes.

JUDGE SAGER: I mean obviously if it's very expensive what is it that's driving them to do

that?

MR. RATTI: I believe that at some point there have been discussions. Indeed there's been a bill introduced in 2010 in the Maryland legislature. And that would have required utilities to purchase offshore wind. So I think there was an interest at that point in time. In case if there is a renewable portfolio standard specifically directed towards offshore wind, they wanted to -- they probably wanted to get ready and start the process since these projects take a long time.

JUDGE SAGER: So let me see if I got that correct. So they are seeing -- They want to be first in line basically if and when the government support comes around because it's going to require government support to do that.

MR. RATTI: Yes, I think you said it better than I did.

JUDGE SAGER: Well, that wasn't my intention. This goes to page 18 of the initial statement. This is I think based on the Maryland RPS. I think you gave a number of 500 to 70 megawatts (170 megawatts I guess actual power) for wind.

So I'm just curious. Where does that number come from? And I think you make the statement

that wind will be limited by the RPS. So explain why that's so.

MR. RATTI: If you just give me one second, I will find it.

JUDGE SAGER: Sure. The initial position statement is page 18. I guess it's page 18, second paragraph.

MR. RATTI: Yes, I believe here I was referring to in the Long Term Electricity Report there is a portion of the RPS that will be fulfilled by in-state resources. I believe I was referring -- and this may not be completely clear here -- the fact that if all of that portion were to be fulfilled with wind power that will be the expected installed capacity that you would have in that case.

If you were referring to the relationship between 560 megawatts versus the 170, I believe that's as we discussed as was discussed before. That's between the two there is a capacity factor of wind.

JUDGE SAGER: So those numbers are based on the LTER, Maryland LTER, projected carveout then.

MR. RATTI: Yes.

JUDGE SAGER: Okay. So why is it that the RPS is going -- If wind power is a great energy source, clean energy source and people want it, why is

the RPS going to limit the upward growth of wind power?

MR. RATTI: So I don't believe that the RPS is going to limit the growth of wind power. I think it's still going to spur the development of wind power. In fact, there will be more wind developed as a result of the RPS.

So I'm not sure. I didn't want to imply that that will be the case. I think the RPS is effective in spurring the development of wind power. There will be wind power built as a result of that.

JUDGE SAGER: Okay. On the next page, the top of page 19, the first sentence, it says, "Thus on balance and in Mr. Ratti's professional opinion, the best estimate for projected installed wind capacity is 21 megawatts which is considerably lower." So why do you think it's going to be less, this value?

MR. RATTI: This is the calculation that comes from again the Long Term Electricity Report. I believe it's Exhibit 5. This comes from I believe the total amount of installed capacity that is expected to come on line as a result of RPS from in-state wind generation. It's about 190 megawatts in that report.

Considering the fact that there is already 120 megawatts that has been effectively developed over

the last year or so or has come on line over the last year or so. There is about 70 left which if you apply to that 70 the capacity factor that gives you the 21 megawatt of average capacity. That's the calculation.

JUDGE SAGER: So Judge Arnold already asked part of this question. I was going to ask why is solar bound by the two percent RPS carveout which of course is because the argument is that solar is uneconomic without some sort of government support.

Yet the Intervenors claim that solar power is cheaper than nuclear power. Can you tell me why the big difference? Why would someone -- Why can one group say that solar power is cheaper? And one say that it's so much more expensive? Do you have any idea what the difference comes from?

MR. RATTI: Well, in one case, I can say that a lot of times when people refer to solar power being cheaper they're talking about the price, not necessarily the cost of solar power. So the cost of solar power I don't think anybody would question that is today significantly higher than nuclear and a lot of other energy sources, not all of them, but most of them.

Having said that, there are incentives in place today that help to close that gap. And in some

cases in some states that gap is smaller. Therefore it's easier to close that gap. Some other states as may be the case for Maryland, that gap is pretty big. So it's more difficult to close that gap.

And also the incentives that are given to close that gap are different in different states. So there may be situations where you do have a case where the price of solar power after you account for all the incentives is actually competitive. And that's why it gets built.

There has been significant solar power being added to the grid in the United States in the last few years. It makes economic sense in that respect.

But a blanket statement that says the cost of solar power is lower than nuclear is -- I would say it's misleading.

JUDGE SAGER: Okay. I'm skipping over to page 21. Let's see if I can -- what I have in my note here. Right, second sentence, "In terms of installed capacity, the LTR reference case predicts that there will be 498 megawatts of new solar capacity installed in Maryland over the next ten years." So that's 498 with a capacity factor that goes down to 75.

But what is that attitude? In other

words, what would the total be? Already there are some. Right. And so that is 498 megawatts is added to what?

MR. RATTI: I don't recall off the top of my head the exact number of megawatts currently existing in Maryland. It's a fraction of the 498.

JUDGE SAGER: So it's much smaller.

MR. RATTI: It's much, much smaller. I don't know if -- I don't want to speculate. But it's certainly a high number today.

JUDGE SAGER: If it's essentially zero today and over the next ten years it's 498, doesn't that apply a very steep angle of takeoff? Would you expect very much larger figures, say, in the next ten years?

MR. RATTI: You mean the ten years --

JUDGE SAGER: Sorry. Let me say that again. If it's zero today and in ten years it will be 498, doesn't that imply that it will be more than double that in another ten years beyond that at 20 years down the road?

MR. RATTI: Under current law, I don't believe that will be the case because again this growth is driven by the carveout in the Renewable Portfolio Standard.

JUDGE SAGER: It's going to go up and hit a ceiling and stop.

MR. RATTI: Yes. That's the scenario as it's described in the Long Term Electricity Report.

JUDGE SAGER: Okay. Sorry. I have to browse through my questions. Okay. On page 27, I read this and I kinda shook my head and realized I didn't understand it. So because of the impacts -- Okay. So it's in Section 2, Comparison of Energy Alternatives, sentence 2. It says, "Because the impacts of any combination of energy alternatives will be greater than the impacts of a natural gas alternative" and then it says -- forget the parenthetical for a moment -- "there will be no combination of alternatives that is environmentally preferable to natural gas." Could you elaborate on that?

MR. LUTCHENKOV: Yes. I think the table that we looked at before when we had the comparison of coal, natural gas, renewables, renewables being on the last column. And Judge Arnold actually keyed in on it that if you look at the differences that if you increase the amount of renewables and decrease the amount of the natural gas that's combined with those renewables, even though the natural gas emissions come

down, there are other NEPA considerations that need to be taken into account of which are archeological, terrestrial, aquatic. I could go down the list. There are about 14 to 16 other items. All those besides the air emissions going down will actually tend to increase especially land with the renewables.

JUDGE SAGER: Okay. I just wanted to make sure I understood that. Let's see. Page 29, paragraph 2, line 7. So let me see. All right. So I guess the sentence is "Even if photovoltaics could be deployed on rooftops and sufficient storage mechanisms were available in conjunction with photovoltaics to produce baseload power, the environmental impacts of the combination of the alternatives still would not change appreciably." Obviously one of the big environmental impacts of very broad renewables is that you have to be able to use broad land use impact.

But presumably when you are using rooftop solar, you don't have that same impact. So could you please explain that statement?

MR. LUTCHENKOV: Just a second to think about that one.

JUDGE SAGER: Okay. Sure.

MR. RATTI: The only thing I would add is

I would say that the combination of solar power that's going to come on line is likely to be a combination of utility scale, ground mount solar power and rooftop. So I think there will be still a significant portion that will come from utility scale installation that use land.

JUDGE SAGER: But basically that statement relies on solar development including a significant amount of utility scale where you have to bulldoze some land and put up some solar panels.

MR. RATTI: Yes.

JUDGE SAGER: Okay. That's all my questions, Judge Spritzer.

CHAIRMAN SPRITZER: Very well. Let's bring up -- I don't have it ready -- Applicant Exhibit 1, the direct testimony, page 11, the paragraph that begins "Offshore wind technology has evolved from onshore wind technology. Today offshore wind technology has been proven for shallow waters typically less than 30 or 35 meter deep with virtually all installations of offshore wind projects in this category." What does the term "proven" mean as it was used? And I think this question is for you, Mr. Ratti. Is it Ratti or Ratti?

MR. RATTI: Ratti.

CHAIRMAN SPRITZER: The problem last night with --

MR. RATTI: No problem.

CHAIRMAN SPRITZER: So what does the term "proven" mean in that paragraph?

MR. RATTI: In my opinion, proven means that there has been a significant number of installations in the order of -- In this case, I believe hundreds of megawatts, mostly in Europe in the North Sea that have been around for several years. So there's a very good understanding of this technology.

CHAIRMAN SPRITZER: So the technology works in the sense of doing what it's supposed to do.

MR. RATTI: Yes.

CHAIRMAN SPRITZER: And are these installations generally owned by private or public companies if you know?

MR. RATTI: For utilities for the most part. So in some case in Europe I think you have state owned utilities as well with some private ownership. So it's a little bit of a mix. But it tends to be owned by utilities.

CHAIRMAN SPRITZER: Private and public utilities.

MR. RATTI: Yes.

CHAIRMAN SPRITZER: As far as do you have any knowledge whether the privately owned wind operations are profitable for the operators? Do they at least cover their costs?

MR. RATTI: Obviously, I don't have access to their financials, but if I can venture I would say they're likely to be profitable.

JUDGE ARNOLD: Before we get away from that question, let's understand what it means. Are electric rates in Europe about equal to what they are in the United States?

MR. RATTI: No, but the point here is that in Europe there is a system of incentives which is slightly different from what you have in the United States. We have so-called feed-in tariffs that are set up. Those are rates at which the utilities are obligated, the buyers are obligated, the distribution utilities are obligated, to take power from certain sources.

Say, if you had an offshore wind facility, you could sell at a certain rate. Same thing for solar power and onshore wind and other renewables.

JUDGE ARNOLD: It's just that when you're talking about whether or not they make a profit, you have to not only look at the costs but also at what

you're giving back, you know, in this case rates. And if they have significantly greater rates there than we have here, then they're making a profit over there. It would not necessarily mean they would make a profit here. So I'm just trying to investigate that.

MR. RATTI: Yes. You're absolutely correct. The price is effectively set artificially by the government. And it's set in such a way obviously that it covers the cost and the reasonable profit. So that's how it works.

In the United States, there are no feed-in tariffs.

CHAIRMAN SPRITZER: No what?

MR. RATTI: No feed-in tariffs.

CHAIRMAN SPRITZER: What's the difference -- Well, in Maryland we have the renewable portfolio.

MR. RATTI: That's right.

CHAIRMAN SPRITZER: Does that in some way provide the same sort of incentive?

MR. RATTI: It could. It's a slightly different mechanism. But it could. The Renewable Portfolio Standard is also coupled with what's called the Alternative Compliance Payment. So effectively the price of power plus the Alternative Compliance Payment in some ways I would say you can say that it

has some similarities to a feed-in tariff. But it's not quite the same thing.

CHAIRMAN SPRITZER: Okay. You mentioned Europe and feed-in tariffs that you were talking about. I take it those are -- Are those in Europe?

MR. RATTI: Yes. They are different depending on the country.

CHAIRMAN SPRITZER: Okay. Are there countries where wind has been installed where there are no feed-in tariffs that you're aware of?

MR. RATTI: There may be. I can't think of one right now. I'm sure it's possible.

MR. VAN DER LINDEN: None that I'm aware of.

CHAIRMAN SPRITZER: If there was a witness that had a -- More than one of you can answer one question.

MR. VAN DER LINDEN: There are none that I'm aware of. They're thinking about doing that, but it hasn't happened in any of the countries yet.

CHAIRMAN SPRITZER: Any of you know what the estimated construction time for Calvert Cliffs Unit 3 would be from time of license is issued, if it's issued, until when commercial operations would begin? Well, let me finish that. To when

construction would be completed.

MR. LUTCHENKOV: Well, the safety related construction is postulated around 60 to 68 months or a five year period roughly. That's still being developed. It's not fine-tuned yet.

CHAIRMAN SPRITZER: Safety related?

MR. LUTCHENKOV: Safety related, that construction which is related to the NRC.

CHAIRMAN SPRITZER: Okay.

MR. LUTCHENKOV: Once you get to COLA. The COL allows you to proceed with it.

CHAIRMAN SPRITZER: And you said 65 to 68 months.

MR. LUTCHENKOV: Yes, about five or so years.

CHAIRMAN SPRITZER: Is there other construction that would be necessary in order to begin commercial operations?

MR. LUTCHENKOV: There's what's considered preconstruction in NRC terms which is the development of the site prior to its ground clearing, grubbing, tree clearing, setting the site up for the initial development.

CHAIRMAN SPRITZER: Is that time in addition to the safety related construction time?

MR. LUTCHENKOV: It is.

CHAIRMAN SPRITZER: And what is the time that would be required for that?

MR. LUTCHENKOV: It would be anywhere from 18 months to 24 months depending on the site.

CHAIRMAN SPRITZER: If we wanted to -- Can that occur before the license is issued or does that --

MR. LUTCHENKOV: It could.

CHAIRMAN SPRITZER: Do you have to request permission from the NRC to start construction early?

MR. LUTCHENKOV: No. That's unrelated to safety related construction. What you need is your appropriate state and federal permits of which we have our state CPCN. We have most of the other state permits and federal permits. We just received our title wetlands permit from the Board of Public Works in Maryland. We are on the cusp of receiving our other title and non-title or Army Corps wetlands permits as well.

CHAIRMAN SPRITZER: Now at present does UniStar intend to begin any of the preconstruction work prior to getting the COL?

MR. LUTCHENKOV: At this time, no. As we stated in the Board of Public Works meeting and

numerous other times, we will not proceed until we have certain factors, key factors, in place, one of which as you know is the U.S. Partner. The other is DOE Loan Guarantee. And the other is Favorable Economic and Regulatory Structure in the state to proceed.

CHAIRMAN SPRITZER: The last term that you used, "Favorable Regulatory Structure" and Federal and State Regulatory Structure, can you be a little more specific about what that means?

MR. LUTCHENKOV: Yes. It's in fact that the -- That actually comes back to the economics as well that the economics within the structure of the state will allow for a profitable entity and a profitable generation of power.

CHAIRMAN SPRITZER: What would the State have to do to accomplish that?

MR. LUTCHENKOV: It's not obvious to me at this point and that's -- Where I am in the company it's not within my purview to answer that at this time.

CHAIRMAN SPRITZER: That's not -- Any of that, whatever those conditions would be, they're not in place as we sit here today.

MR. LUTCHENKOV: That is correct.

CHAIRMAN SPRITZER: And the loan guarantee, UniStar does not have a loan guarantee as we sit here today.

MR. LUTCHENKOV: The loan guarantee we do not have, but we are active in pursuing it.

CHAIRMAN SPRITZER: The CAES technology, has this actually been used anywhere in combination with wind and solar to generate baseload power?

MR. VAN DER LINDEN: Not as baseload power. It's being used in Germany. There's only one facility at Huntdorf near Bremen in Germany. That was built 35-40 years ago. And at that time they didn't have wind. But it was built specifically to support a nuclear plant where it could provide 290 megawatts in less than three minutes to support the plant.

Later on, they found it very useful as they started building more wind power. There is actually wind at the site today. And they use some of that.

CHAIRMAN SPRITZER: That facility is still in existence?

MR. VAN DER LINDEN: That facility is still existing. There's another one in the U.S. and they've been operating very satisfactorily. And nothing has been built since they were completed.

CHAIRMAN SPRITZER: You said they've been operating satisfactorily. To do what?

MR. VAN DER LINDEN: Well, the one in Germany provides what we call firm capacity. In other words, when it's called upon it delivers. It doesn't have to run. So they get paid by not running.

Now the one in Alabama supplements their system in terms of meeting mid-day about 45 hours of load. And from that standpoint it's served them very, very well. They also have a small storage facility. They have coal. They have gas. And they have gas turbines as standby. So they are well equipped to deal. If they had wind there, they could deal very well with wind. They don't have wind.

CHAIRMAN SPRITZER: The facility in Alabama, what is it getting power from? Wind? You said they're not getting wind.

MR. VAN DER LINDEN: No, no. It's getting power from its coal plants at night.

CHAIRMAN SPRITZER: Oh, I see.

MR. VAN DER LINDEN: Yes. That way they don't have to deload them. So they run at a more efficient point and they don't increase emissions. So that's a very useful application.

CHAIRMAN SPRITZER: And the plant in

Germany, what is its source of power? The CAS.

MR. VAN DER LINDEN: The source of power there is from the grid, nighttime.

CHAIRMAN SPRITZER: So neither of those are running in combination with wind or solar.

MR. VAN DER LINDEN: No, no solar at all. There is some wind in Germany, yes. I might add the purpose of the unit in Germany was as a support system. It wasn't intended to really integrate wind because it's a non-recuperative system.

In other words, the efficiency isn't as good as it could be if they had a recuperative system. I think I explained it in some of the documents between the two technologies. It's the same technology except the one is designed to start up very rapidly with a high power amount. And that was the purpose. But if there is any excess power like wind and wind spillage, yes, they can accommodate that.

CHAIRMAN SPRITZER: I take it from your testimony you have some familiarity with the German electrical system.

MR. VAN DER LINDEN: I know a little bit about what goes on because I follow it.

CHAIRMAN SPRITZER: It's I think been a matter of some public attention that they've decided

to abandon apparently over time their existing nuclear facility. Maybe abandon is the wrong term.

MR. VAN DER LINDEN: Yes. Correct.

CHAIRMAN SPRITZER: Cease operation of their --

MR. VAN DER LINDEN: They are phasing them out because they believe that the renewables such as wind could replace it. But they're going to find that extremely difficult. And they're going to have to look for large storage facilities. And that's going to increase the cost of wind which is already in terms of German rates and what we pay here quite excessive.

CHAIRMAN SPRITZER: What kind of storage facilities would be available to them to combine with wind?

MR. VAN DER LINDEN: Europe has a lot of salt domes like we have here in the lower part of the country. So these are used for natural gas storage. These domes are fairly large. So like the facility at Huntdorf you can store natural gas in the dome as well. You can solution minus cylinder and store air. They will be looking at those.

But Germany has on another path. They want total green energy. So they're looking at CAES that uses no fuel at all. But they'll still need

storage. And the heat from the compression cycle would be stored in a thermal storage device. Of course, that makes it very expensive.

And at the moment they're struggling with the concept of storing that heat and the materials of the compressors that have to withstand very high temperatures. So that's another -- My estimation of saying they're probably another 15 years away before that comes about. But they're on that mission. Whether they'll achieve it or not, I don't know.

CHAIRMAN SPRITZER: In the interim while they're looking for these storage solutions, are they intending to use backup natural gas or coal facilities to work in conjunction with the wind to generate baseload power?

MR. VAN DER LINDEN: Yes, they do have natural gas backup. I can specifically mention Spain that has a very high renewable portfolio in terms of wind and solar. So they put in these combined cycles and they would run them at 60 percent load. Now that's not always a very efficient operating point for combined cycles. Some manufacturers have adjusted to that.

What the result is that if they lose 300 or 400 megawatts of wind which happens and happens

fairly frequently then these plants can ramp up from the 60 percent load to the full load. If you have an 800 megawatt combined cycle plant that's a lot of capacity you can put on in a very short time.

However, if they have to shut them down at night because there's no demand, some manufacturers have designed the plant to idle at night while still meeting emissions. Then they can ramp up in the morning. But that is the way it will have to operate.

If you're going to depend on 1,000 megawatts of combined cycle, you're not really getting that. You're getting 600 megawatts. The other 400 is there to accommodate wind. So that becomes an expensive support system.

CHAIRMAN SPRITZER: Let's turn to page 13 of Applicant's Exhibit 1. Actually let's go to page 14 at the top.

JUDGE SAGER: What section is that?

CHAIRMAN SPRITZER: This is Mr. Ratti again I believe, although any of you can provide an answer. "East Coast installation cost," the second sentence on the page. "East Coast installation cost," this is for onshore wind turbines I believe, "are likely to be well above $1500 per kilowatt. For reference, the 2011 Long Term Electricity Report for

Maryland assumes installed costs for onshore wind farms at $2200 per kilowatt increasing to $1800 per kilowatt after 2011." And it goes on to give some figures on O&M costs.

My question is can you give me some information as to how those costs would compare to Calvert Cliffs if they're possible to compare for the same type of costs.

MR. RATTI: I don't know how they figure for Calvert Cliff that I can compare to directly.

CHAIRMAN SPRITZER: Okay. None of the other UniStar witnesses have that data either.

MR. LUTCHENKOV: I don't know if I have that in front of me.

CHAIRMAN SPRITZER: Okay. If you don't have it, you don't have it. Page 18 again of Applicant's Exhibit 1, paragraph A-29, we're talking about the cave wind project. You said it was announced in 2001 and received its local and state permits in 2009 and most federal permits in 2010 and 2011. Do you know when they applied for the federal permits? I guess this is Mr. Ratti again.

MR. RATTI: I believe, but I'm not completely sure, it was in the 2005-2006 time frame that they actually applied. But I would have to

check.

CHAIRMAN SPRITZER: Now at the end of the next paragraph you refer to the DOI's -- that's Department of Interior I take it -- Smart from the Start initiative which you is taking steps to attempt to reduce the length of the permitting process at least at the federal level, what specifically are they doing?

MR. RATTI: I'm not intimately familiar with the initiative. But I believe they are trying to streamline the process so that time lines are shorter than they have been in the past with the expectation that if there are more projects coming through the pipeline they could be processed more quickly. I'm not sure as to specifically inside the Department how they plan to accomplish that.

CHAIRMAN SPRITZER: Okay. Now on page 20 in the second single-spaced paragraph you talk about wind energy areas in the Atlantic. I take it the Department of the Interior is attempting to focus on expediting permitting for those specific wind energy areas.

MR. RATTI: Yes. This is one of the initiatives within the Smart from the Start. So that will be one example.

CHAIRMAN SPRITZER: Is there such a wind energy area off of the coast of Maryland?

MR. RATTI: Yes. There is for sure. I don't recall the map of the wind energy areas. But certainly that's a wind energy area.

CHAIRMAN SPRITZER: Why did they select Maryland if you know?

MR. RATTI: Well, in general, Maryland has the waters off the coast of Maryland have a high wind energy potential, offshore wind energy potential. So certainly those would be a candidate for offshore wind.

CHAIRMAN SPRITZER: Now at the bottom of page 23, you talk about a scenario that is apparently -- the LTER apparently considered as a possibility. Namely, you're expanding the RPS that currently exists to require 30 percent renewable by 2030. I take it that would be in place of the current requirement for 20 percent by 2022. Is that correct?

MR. RATTI: Yes.

CHAIRMAN SPRITZER: Do you know what the status of that initiative is today?

MR. RATTI: I don't believe there is a specific initiative that refers to increasing the RPS from 20 percent to 30 percent. I believe this was

simply a scenario that was considered in the report that would have a higher renewal penetration.

CHAIRMAN SPRITZER: All right, gentlemen. That's all I have. Thank you.

JUDGE ARNOLD: I just have one other set of questions. You were here earlier when I was questioning the staff concerning the conclusions of the final environmental impact statement.

MR. RATTI: Yes.

JUDGE ARNOLD: I just had them display Figure 9-4 showing the environmental impacts of the various alternatives. Do you recall that?

MR. RATTI: Yes.

JUDGE ARNOLD: And the staff witness essentially came to the conclusion that no matter how much you increase the solar and wind contributions the combination alternative would not be environmentally preferable to nuclear power. Would you agree with that?

MR. LUTCHENKOV: Yes, I would and that's reflected on their bounding analysis as well where they took and quadrupled the wind. And the NEPA evaluation essentially comes out the same which is there is no alternative including these combination alternatives that are environmentally superior or

equal to the proposed project, Calvert 3.

JUDGE ARNOLD: Thank you.

CHAIRMAN SPRITZER: All right. I don't think we have any further questions. Again, we had said at the end of each group of witnesses we would take a break if anyone wanted to propose any rebuttal questions.

Mr. Mariotte, do you have any rebuttal questions? Do you want to consider proposing any rebuttal questions for these witnesses?

MR. MARIOTTE: Yes. I have two although I'm having a hard time putting one into a question form. But, yes, I have two.

CHAIRMAN SPRITZER: Why don't we take a ten minute break then and do that and we'll come back and wrap up the day at that point.

MR. MARIOTTE: All right. Your Honor, could you explain to me the process? Should I write out a question and hand it to you?

CHAIRMAN SPRITZER: Write out a question, hopefully one I can read, and I will --

MR. MARIOTTE: Easier said than done. Thank you.

CHAIRMAN SPRITZER: All right. We'll give you ten minutes. Be back at 5:30 p.m. Off the

record.

(Whereupon, a short recess was taken.)

CHAIRMAN SPRITZER: All right. Let's go back on the record.

All right. We have two questions from the NRC staff. Mr. Ratti, you testified that it was possible to build a 1600 megawatt wind or solar facility in Maryland by 2022. Is that correct?

MR. RATTI: I think the question was whether the development and construction time of solar and wind is within the next -- is possible to build something that has not been announced yet today and have that completed by 2022. So I think the answer to that question is yes. I don't think if I implied that I believe it's possible to build a 1600 megawatt solar facility. That was not my intent.

CHAIRMAN SPRITZER: All right. In any event, whatever you may have said previously, the next question is is it probable that 1600 megawatts of wind or solar will be built or installed in Maryland by 2022.

MR. RATTI: No, it's not possible as I said in the testimony.

CHAIRMAN SPRITZER: Not possible or not probable?

MR. RATTI: It's theoretically possible. It's highly unlikely.

CHAIRMAN SPRITZER: But what are the obstacles that you would see to doing that?

MR. RATTI: The main would be probably economics again. There is not enough incentives to really justify the construction of so much wind in Maryland. And also there would be problems of grid integration and all that.

CHAIRMAN SPRITZER: Okay. Next question, is one of the goals of Maryland's RPS to encourage the use of renewable energy in order to drive down the costs so that it could potentially be competitive with other electricity sources and thus continue to grow in the post RPS period?

MR. RATTI: That could be considered to be one of the intents. Yes, it is I believe the hope of the legislature to drive down cost further than it is today so that eventually at some point in the future these sources could be competitive with conventional sources. Yes.

CHAIRMAN SPRITZER: From what I understand when -- Well, let me back up a minute. For utilities that purchase I believe they're called RPS credits.

MR. RATTI: Renewable energy certificates.

CHAIRMAN SPRITZER: Yes, certificates. Sorry. Can they purchase those from the state or only from other utilities?

MR. RATTI: The utilities purchase those credits or certificates from producers of power so if the owner of a power plant would sell their certificate to a load serving entity.

CHAIRMAN SPRITZER: Is there some way a utility in Maryland can pay money to the state to effectively reduce the number of certificates that it has to purchase?

MR. RATTI: Yes.

CHAIRMAN SPRITZER: Or has to have?

MR. RATTI: Yes, they can elect to pay the alternative compliance payment which is also expressed in dollars megawatt hours. So in the case of solar for the solar carveout they can pay today $400 a megawatt hour. If they decide not to purchase solar renewable energy certificate, that is part of the law. There is the same thing on the Tier 1 RPS.

CHAIRMAN SPRITZER: And the money the state receives from those payments, do you know what it's used for?

MR. RATTI: It's typically used -- I believe that's the case for Maryland as well --

invested in research to improve the cost and the technology for renewables.

CHAIRMAN SPRITZER: Improve the cost, I assume you mean reduce the cost.

MR. RATTI: Reduce the cost, yes.

CHAIRMAN SPRITZER: Okay. Which seems consistent with what you were saying earlier that one of the purposes at least behind the law is to help drive down the cost of renewables over time.

MR. RATTI: Yes. It is a self -- it is a mechanism that is, yes, if the RPS turns out to be too stringent and so therefore it can't be met with physical capacity, then the expectation is that there will be some money to be invested to actually reduce the cost so that in the future the RPS could be met with physical capacity.

CHAIRMAN SPRITZER: Next question. The report on -- Well, let me back up. And maybe I can find that unless you happen to know the exhibit number.

JUDGE ARNOLD: Fourteen or 15. Oh, 16.

(Off the record discussion.)

MR. MARIOTTE: It's JNT-12.

CHAIRMAN SPRITZER: Yeah. Okay. JNT-12. The question is the report on solar versus nuclear

costs submitted by Joint Intervenors and referred to earlier was chosen among other reports showing similar conclusions because it is specific to North Carolina. And, witness, can you -- Excuse me -- connect -- Well, excuse me. Can you comment on the relative solar potential of North Carolina and Maryland?

MR. RATTI: The potential of North Carolina is likely to be better than Maryland, probably not significantly, not a lot better. There is, I believe, as part of one of the exhibits, although I certainly cannot recall which one, a map of the solar resources within the United States with different colors that go from light yellow to dark red. And if you look at that map, I believe that North Carolina will be a little bit darker than Maryland, so a little bit better, but not as good as say the Southwest.

CHAIRMAN SPRITZER: Now this report, JNT-12, is entitled "Solar and Nuclear Costs: The Historic Crossover: Solar Energy is now the Better Buy." And you can see the little diagram on the cover. It seems to show solar and nuclear costs intersecting in 2010 and continuing to decline below nuclear after 2010. Have you read this report?

MR. RATTI: I have, but not in detail.

I'm not intimately familiar with it. But I believe again it goes back to one of the previous questions. I think there is a difference here between price and cost again. In some cases, solar power is likely to be priced at a level that will be considered to be lower than the cost of producing nuclear power. I think that's probably a fair statement.

But again the price of solar power today is reduced through heavy use of incentives, the Federal Tax Credit and Solar Portfolio Standards. And so that's -- it's probably not a fair apple-to-apple comparison.

CHAIRMAN SPRITZER: But if we're looking at the question of whether solar is economically viable we would certainly want to take into account, wouldn't we, whatever federal incentives there are even though they may interfere with other market choices there would otherwise be? We would want to take the federal incentives into account in making that analysis, wouldn't we?

MR. RATTI: Yes. So I would say that it's fair to say that in some cases solar could be priced lower than what the cost of producing nuclear power would be. I would also say that in my testimony -- I don't recall the specific place -- I do refer to the

DOE Annual Energy Outlook that is an authoritative source of cost of different types of power generation. And the cost of solar power -- now we're talking about the cost without any incentives. So just the raw costs -- is significantly higher than nuclear and most of the other resources, say, for offshore wind probably.

CHAIRMAN SPRITZER: How is that usually measured? In kilowatt hours or?

MR. RATTI: That is usually measured in kilowatt hours. It's called the levelized cost of electricity. It takes into account the capacity factors, financing costs and a lot of other assumptions.

MR. SMITH: For completeness, he's referring to the Applicant's rebuttal testimony which is Applicant Exhibit No. 55 and in paragraph A-15 which is on page 9.

CHAIRMAN SPRITZER: Okay. Thank you.

Have either of the other UniStar witnesses read this report, JNT-12?

MR. LUTCHENKOV: No.

MR. VAN DER LINDEN: No.

CHAIRMAN SPRITZER: Okay. And we didn't have any rebuttal questions from UniStar, did we?

(No verbal response.)

All right. Unless anybody has anything further, I believe we're done for today. We will reconvene at 9:30 a.m. tomorrow morning which at time we'll very much look forward to meeting Mr. Sklar. Off the record.

(Whereupon, at 5:41 p.m., the above-entitled matter was recessed to reconvene at 9:30 a.m., the next day.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

Proceeding: Calvert Cliffs III Nuclear Project Evidentiary Hearing

Docket Number: 52-016-COL

ASLBP Number: 09-874-02-COL-BD01

Location: Solomons, 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 and thereafter reduced to typewriting under my direction and that said transcript is a true and accurate record of the proceedings.

Neal R. Gross

Official Reporter
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