IN THE PUBLIC UTILITIES COMMISSION OF OHIO

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In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company for Authority to Provide for a Standard Service Offer Pursuant to R.C. 4928.143 in the Form of an Electric Security Plan.	:	Case No. 14-1297-EL-SSO

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DEPOSITION

of Judah L. Rose, taken before me, Carolyn D. Ross, Registered Professional Reporter, and a Notary Public in and for the State of Ohio, at the offices of FirstEnergy Corporation, 76 South Main Street, Akron, Ohio, on Wednesday, January 7, 2015, at 8:00 a.m.

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ALSO PRESENT:

Ms. Kathleen Kline,
Mr. Hisham Choueiki,
Ms. Tammy Turkenton.

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Wednesday Morning Session,
January 7, 2015.

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(Witness placed under oath.)

MR. ALEXANDER: Good morning. This is Trevor Alexander from the firm of Calfee, Halter & Griswold. I'm one of the lawyers representing the companies. Also here is Jim Burk on behalf of the companies.

Could everyone appearing via telephone please identify themselves at this point?

MR. PETRICOFF: This is Howard Petricoff. Good morning, Jim and Trevor. And Mike Settineri will be joining as well, and that's for RESA, P3, and EPSA.

MR. ALEXANDER: Howard, was it EPSA or Exelon?

MR. PETRICOFF: It was EPSA, E-P-S-A.

MR. DARR: Frank Darr, I'm here on behalf of IEU Ohio.

MR. O'ROURKE: Ryan O'Rourke, I'm counsel for staff.

MR. ALEXANDER: Colleen, could you go again, please?

MS. MOONEY: Yes. This is Colleen Mooney, with Ohio Partners for Affordable Energy, 231 West Lima Street, Findlay, Ohio.

MR. STINSON: Dane Stinson on behalf of the Northeast Ohio Public Energy Counsel.

MS. HUSSEY: Rebecca Hussey on behalf of Ohio Manufacturers' Association Energy Group.

MR. ROYER: Barth Royer on behalf of the Cleveland Municipal School District.

MR. OLIKER: Joe Oliker on behalf of IGS Energy.

MR. SAUER: Larry Sauer, OCC.

MR. SCHULER: Mike Schuler, OCC.

MS. FLEISHER: Madeline Fleisher on behalf of the Environmental Law & Policy Center.

MR. KOPON: Owen Kopon, Nucor Marion.

MR. ALEXANDER: Okay. Is there anyone else on the telephone who has not yet identified themselves?

MR. CHOUEIKI: Hi. Good morning. This is Hishom Choueiki with staff, but I'm not a lawyer so I won't be speaking.

MR. ALEXANDER: Good morning.

MS. TURKENTON: Also Tammy Turkenton

with staff.

MR. ALEXANDER: Good morning, Tammy. Okay. With that --

MR. FISK: And I'm Shannon Fisk, here on behalf of the Sierra Club.

MR. SOULES: Michael Soules on behalf of Sierra Club.

MS. KLINE: I'm Kathleen Kline with Sierra Club, I won't be speaking. All right.

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JUDAH L. ROSE,

being by me first duly sworn, as hereinafter certified, deposes and says as follows:

CROSS-EXAMINATION

BY MR. FISK:

Q. Good morning, Mr. Rose.

A. Good morning.

Q. How are you doing today?

A. Okay.

Q. Good. Good. Could you please state your complete name for the record?

A. Judah L. Rose.

Q. Okay.

A. J-u-d-a-h, Judah.

Q. And what's your business address?

A. 9300 Lee Highway, Fairfax, Virginia, 22031.

Q. Okay. Who are you employed by?

A. ICF International.

Q. Okay. And what is your title there?

A. Managing director.

Q. Okay. Great.

And in your role as managing director, what do you do at ICF?

A. I comanage the -- or colead the Energy Advisory Services practice, which is a -- the energy consulting portion of the business. I focus primarily on electric power.

Q. And who do you report to?

A. I report to Eric Olbeiter.

Q. Okay. And who is he?

A. He is a manager at the -- in our area.

Q. Okay. The Energy Advisory Services?

A. Yeah.

Q. Okay. And does anyone report to you?

A. Yes.

Q. Okay. How many -- about how many people?

A. You know, between 30 and 105, depending on how broadly you define reporting, it's to colead the Energy Advisory Services group.

Q. Okay. And did anyone at ICF work with you on this proceeding?

A. Yes.

Q. Okay. And how many people?

A. Roughly maybe five people.

Q. Okay. Okay. And what -- what sort of tasks did they do for you on this proceeding?

A. They assisted in the computer modeling, and in the analysis of the results of the computer modeling, and overall project activities, including client contact, et cetera.

Q. Okay. And did you -- did you personally do any of the modeling that's represented in your testimony?

A. I directed it, but I didn't actually do the actual pushing of the buttons.

Q. Okay. Who did that?

A. Jamie Cotrone, C-o-t-r-o-n-e, and Lalit, I don't remember his full name.

Q. And when you say you direct -- I believe you said you directed the modeling that they did.

What do you mean by that?

A. I directed the entire project, and I reviewed all aspects of the work.

Q. Okay.

A. And was very much involved in the overall development of the product.

Q. Okay.

A. I would add that David Gerhardt and others were also involved in the calculations that occur after the modeling, and including lots of the spreadsheets that are put together.

Q. Okay. And did you -- did you personally draft your testimony in this proceeding?

A. Yes.

Q. Okay. And in terms of the modeling that was done, what did you do to review the modeling that your staff did?

A. I reviewed the inputs, I reviewed the outputs, and I reviewed the related calculations.

Q. Okay. And when you say you reviewed them, what did you do to review them?

A. I reviewed them for reasonableness, for appropriateness, for accuracy, and that's what I did.

MR. ALEXANDER: Did someone just join

the call?

MR. PARRAM: Good morning, this is Devin Parram on behalf of The Kroger Company.

MR. ALEXANDER: Good morning, Devin. Go ahead.

BY MR. FISK:

Q. Okay. And it's my understanding that you are testifying today on behalf of Ohio Edison Company, Cleveland Electric Illuminating Company and Toledo Edison Company; is that correct?

A. Yes.

Q. Can we agree to refer to those three collectively as the companies?

A. I can agree.

Q. Okay. Great.

And have you communicated with anyone regarding this proceeding who is employed by any of the companies?

A. I don't know.

Q. Okay. Who -- who have you communicated with outside of ICF about this proceeding?

A. Mark Hayden, David Pinter, Scott Casto, those are the three people that I know that I believe are employees of one of the FirstEnergy set of

companies that I've been dealing with.

Q. Okay. And anyone else involved in the FirstEnergy companies?

A. Not that I can remember.

Q. Okay. And do you know who David Pinter is?

A. Yes.

Q. And who is he?

A. I know who he is.

Q. I mean, what company he works for?

A. That, I -- I can't tell you specifically.

Q. Okay. Okay. And Scott, I believe you said Castro; is that correct?

A. Casto.

Q. Casto?

A. C-a-s-t-o.

Q. Do you know who he works for?

A. Not precisely sure.

Q. Okay. And have you ever communicated with Jay Ruberto?

A. No. But as I'm sitting here, I've also dealt with Ebony, another in-house lawyer at one of the companies, and there were some others that I've

dealt with as well, but I can't remember all their names.

Q. Were they all in-house counsel, do you think, or --

A. No. I think some of them, as I'm recalling, were not necessarily lawyers, and I just can't remember everybody's names.

Q. Okay. Okay. But Jay Ruberto was not someone you've communicated with?

A. I've seen the name, but I don't believe he was in this set of people that I've been meeting with physically.

Q. Okay. How about any written communications?

A. I can't remember any specific communications with Jay.

Q. Okay. Jason Lisowski, have you communicated with him?

A. I don't believe so. I can't rule it out, but I don't believe so.

Q. Okay. And do you know, does ICF have a consulting agreement with any of the companies regarding this case?

A. Yes. Has a consulting agreement, and I

know -- my testimony is on behalf of the companies, but I don't remember the details of the agreement.

Q. Okay. So you don't know if the agreement is actually with the companies?

A. I'm not sure.

Q. Okay. Okay. Do you know -- well, strike that.

The payment for your time on this proceeding, does this go to ICF directly?

A. Yes.

Q. Okay. And do you know, is ICF being paid for your time by any of the companies?

A. Well, let me put it this way, what I believe is that the agents of the company have hired me.

Q. Okay.

A. And I expect to be paid.

Q. Sure.

A. And as far as I know, I am being paid, but the exact affiliations and the relationships and the agency aspects of it, haven't focused in on it and I can't speak to.

Q. Okay. Are you aware that this proceeding involves a proposed agreement under which

FirstEnergy Solutions would sell capacity, energy and ancillary services from its Sammis, Davis-Besse plants, and its share of the OVEC plants to the companies?

A. Yes. I have some general understanding to that effect.

Q. Okay. And are you -- my understanding is your testimony in this proceeding deals with projections of energy prices and natural gas prices, correct?

A. Yes, and other related aspects --

Q. Okay.

A. -- of market conditions.

Q. Okay. Are you offering any opinions regarding the proposed agreement that I just referenced between FirstEnergy Solutions and the companies?

A. I don't know exactly what you mean by that, but the focal point, as you described, is for the market -- the market-related issues. I'm not opining as to whether the Commission should approve the arrangement or not.

Q. Okay. All right. And do you know, approximately when did you first become involved in

this proceeding?

A. Sometime in the spring of this past year, 2014.

Q. Okay. And how did that -- how did that involvement come about?

A. We were called -- or I was called and asked to provide assistance related to this case.

Q. Okay. Do you recall who called you?

A. You know, I think it's one of the -- I think it might have been Mark Hayden, but I'm not 100 percent sure.

Q. Okay.

A. I did also have some conversations with David Pinter, but I can't really specifically recall.

Q. Okay. Do you recall having any substantive conversations regarding this proceeding with anyone who isn't a lawyer for one of the FirstEnergy companies?

A. Yes.

Q. Okay. And who would that be?

A. I don't believe David Pinter's a lawyer, and there were, I believe, other people I spoke to who were not lawyers.

Q. Okay. And did they provide you any --

or, what was the -- this -- the focus of your conversations with David Pinter?

A. Instructions related to the assignment.

Q. Okay. What sort of instructions?

A. To provide projections for market-related parameters, mostly prices, at over -- for a specific period of time and for specific locations and specific products.

Q. Okay. So in your testimony, you offer projections in market energy and capacity prices over the next 20 years; is that correct?

A. That's the primary piece of information that I'm providing. It's not the only thing, but it's the primary.

Q. Okay. And your energy price forecast, that's tied largely to a forecast of natural gas prices that you also present in your testimony; is that correct?

A. Natural gas prices are an important parameter, but it's tied to other things ranging from coal prices, electricity demands, transmission constraints, various different other costs that contribute to the determination of prices for electrical energy.

Q. Okay. And then your testimony also discusses a series of assumptions upon which your various projections are based; is that correct?

A. Yes.

Q. Okay. And did you discuss any of those assumptions with anyone at FirstEnergy before using them to generate your projections?

A. I believe there was some discussion of what our assumptions were, but it was very cursory.

Q. Okay. Do you recall what those cursory discussions were?

A. There were some discussions related to the modeling, level of detail that was required, and general levels of assumptions and an approach.

Q. Okay. And when you say "the modeling," are you referring to the modeling that you did in this proceeding as opposed to any modeling that the company may have done?

A. It was primarily related to the modeling that we did, but also the level of detail and the type of information and the format that they needed the information in for their analysis.

Q. Okay. And what was the discussion regarding the level of detail?

A. That -- the discussion primarily focused in on the fact that there would have to be a fairly high level of detail for the analysis, because it was related to individual locations on the grid.

Q. Okay. When you say "high level of detail," do you mean lots of detail or do you mean doing an analysis at a high general level?

A. I mean lots of detail.

Q. Lots of detail.

A. In particular, they indicated the nodal location and the temporal disaggregation of the material, of the results.

Q. When you say "temporal disaggregation," what do you mean?

A. Hourly information as opposed to annual information.

Q. So the projections that you provided were provided on an hourly basis?

A. Yes.

Q. Okay. And that's for energy prices?

A. For electric energy prices.

Q. Okay. But I assume that capacity prices and natural gas prices were not hourly, correct?

A. Correct.

Q. Okay. Those were provided in what temporal timeframe?

A. Capacity prices are provided on an annual basis, and gas prices are provided on a monthly basis by year.

Q. Okay. Okay. And did you -- with regards to the energy prices that you provided, did you -- after you generated hourly projections, did you translate those into any other temporal timeframe?

A. For sure annual averages.

Q. Okay.

A. I can't remember if we did any other additional averaging.

Q. Okay. How do you convert from the hourly to the annual average?

A. You add up all of the hourly prices and divide by the number of hours in the year, which in a non-leap year is 8,760.

Q. Okay. Okay. So going back to the -- to the discussions of your assumptions, were there any discussions about whether you should be using different assumptions than what you were proposing to use, those sorts of things?

A. No. It was more -- it was a very brief conversation, may have been, you know, as many as five or 10 sentences, that just indicated that we hadn't, in my view, adopted assumptions that were considered crazy or, you know, outlandish.

Q. So the company was trying to make sure you hadn't adopted assumptions that were crazy and outlandish?

A. Yes.

Q. Who was that conversation with?

A. I believe it was with David Pinter and, again, it may have been five sentences.

Q. Okay.

A. It was a very brief conversation.

Q. Okay. Once you were finished with your projections, what did you -- what did you do with them?

A. We provided them to the client.

Q. Okay. Who at -- who did you provide them to specifically?

A. I -- I don't remember exactly who we provided them to, but they were people that work with David Pinter and Mark Hayden.

Q. Okay. And were those provided in a

report or how -- what format were they provided?

A. The primary communication mechanism was Excel spreadsheets.

Q. Did you accompany that -- those Excel spreadsheets with any sort of report or explanation of your projections?

A. Well, I mean, there was some discussion as to sort of how the outputs are organized, and eventually we did provide a report in the form of draft testimony and then final testimony.

Q. Okay. And you referenced that the inputs -- or, the projections were provided in Excel spreadsheets. They were not generated in Excel spreadsheets, correct?

A. That's correct. There is some post processing of the computer model outputs which is done in Excel spreadsheets, but the meat of the calculations, it's done in very large, sophisticated computer models.

Q. Would you consider an Excel spreadsheet a large, sophisticated computer model?

A. Not as large and as sophisticated as the -- for example, the linear program that is solved by the IPM model or the complexity of the GE-MAPS

model, but I wouldn't say that it's unsophisticated or small, depends on the spreadsheet. It's just that the models we're using are among the most largest and most sophisticated computer modeling activities that occur, you know, worldwide.

Q. Okay. And you mentioned, I believe, too, IPM and GE-MAPS; is that correct?

A. Yes.

Q. Okay. What makes -- what makes the IPM model large and sophisticated?

A. Well, there's the size of the matrix that has to be solved in the case of either of the models, but in particular IPM; it's the nature of the software that's needed to solve these matrices in a reasonable timeframe; it's the complexity of the calculations that lead to the large size of the matrix, et cetera, that creates the complexity.

Q. Okay. When you say the matrix to be solved, what is that referring to?

A. There's a series of equations that are generated as part of the analysis of the market conditions.

Q. Okay.

A. And that manifests itself in a matrix of

equations that need to be solved.

Q. Okay. And the IPM model, I guess, so is it looking at the energy grid as a whole in the country or, like, kind of what's the geographic scope of it?

A. The North America -- North America.

Q. Okay. And does it have data for basically every generating plant in North America in it or --

A. Yes. I mean, there is some level of approximation, particularly for smaller generators, but it does cover all of the generating facilities in North America.

Q. Okay. And is that one of the things that makes it a sophisticated model?

A. Yes.

Q. Okay. Any other elements that make it a sophisticated model?

A. It is an extremely large number of elements that make it a sophisticated model. So, for example, there's the power plants, then there's the transmission, there's the regional disaggregation of demand, there's the treatment of capital investment, including retrofitting, mothballing, retirements, new

entry, with which power plants will be built, which power plants will be operated, how the cost of operation is determined, how the competition will manifest itself.

So there's -- within each of those areas, there's many layers of sophistication that lead to the unusual situation that -- so, for example, not only are the private companies using IPM, but also the federal government, including EPA, as you know is clear from the case.

Q. Okay. And having all that information, do you feel that as part of what the model analyzes, does that make the results of the model more robust?

A. Yes. I do think that the process by which the forecast is made is a -- one of the criteria for judging the efficacy and usefulness of the forecast.

Q. Okay. What would be the other criteria for judging the efficacy and usefulness of a forecast?

A. You know, the scope of the issues that are treated, which is related to the issues that we're discussing, but just to be a little bit more explicit, but I think also the quality of the

assumptions and the -- the quality of the outputs.

Q. And could the IPM model be used to project operations and revenues that you expect a certain generating unit to have over, you know, a timeframe?

A. Yes.

Q. Okay. And do you feel doing so would -- using the IPM model to do so would create robust results?

A. It can. I mean, I think, you know, partly it's in comparison to what. A lot of times the model's being used to provide assessment of market conditions, which necessarily involve the interaction of supply and demand and the individual power plants, but it is with less detail than other modeling exercises might have because the focus is on market conditions, which is reflective of a lot of different factors as opposed to focusing in on a specific power plant.

Q. So you're saying the IPM model might have less detail and sophistication if you were looking at an individual plant than other models might?

A. Yes. Particularly in power

plant-specific models that the owners have. It's common that the owners and operators of the power plant being much closer to the power plant have information that's not public or is just more up to date or better or more detailed, et cetera.

Q. Okay. And so then the owners of the power plant, after they get your projections, they could use a different model, like Strategist, or something to evaluate their plan?

A. Yes. It's -- you know, it could be that type of model or other types of models that they use. It's not uncommon.

Q. What other types of models would you typically see used to do the evaluation of a specific plant by utility?

A. I mean, it ranges from the models that we use to sort of customized models that the owners have that reflect their commercial activities and their particular assets.

MR. ALEXANDER: Did someone join the call?

MS. BRADY: Yeah. Hi. This is Cynthia Brady from Exelon.

MR. ALEXANDER: Good morning. Go ahead.

BY MR. FISK:

Q. Okay. And do you know those models, I mean -- well, I guess I mentioned Strategist, but do you know of other kind of commercially available models that a utility would typically use?

A. Well, you know, as I indicated there's sort of two categories; the customized and the, if you will, licensable. You know, those are the models that we use; there's Promod, Strategist is a particular type of model, as well. So there are a few out there that I could think of. I don't have an exhaustive set with me, and I certainly can't speak to the customized, which are, you know, proprietary models of the asset owners typically.

Q. Would you use an Excel spreadsheet to do revenue projections for a power plant?

A. Yes. It's common that we would. In fact, all of our projections ultimately I think believe -- ultimately get to a spreadsheet of some sort or another. It's -- but most of the time, it's when we're doing the analysis of an individual power plant the parameters are coming from the model, itself, the larger computer program.

Q. Okay. So from the IPM or something like

that?

A. Or MAPS or something like that.

Q. Or MAPS, okay. Okay.

And you -- you generated, you said, your energy prices in an hourly format, correct?

A. Yes.

Q. Okay. And if you were then projecting revenue for a plant, would you then do some sort of hourly dispatching for that plant to project out their revenues in the future?

A. Sometimes. I mean, that is -- sometimes we do it for hour types and sometimes we do it for individual hours, it depends on the situation, and, you know, sometimes we have additional variations, like, bihourly.

Q. Are you aware that various intervenors in this proceeding have filed testimony last month?

A. Yes.

Q. Okay. Have you reviewed any of that testimony?

A. I have reviewed some of it to some degree.

Q. Okay. Do you know what testimony you've reviewed?

A. I've reviewed Mr. Comings, Mr. Wilson, and -- I mean, I received seven testimonies -- there was some Wal-Mart testimony, there was other testimonies, and I can't remember everybody's affiliation and name sitting here.

Q. Sure.

A. But I did review them to some degree.

Q. Okay. Do you know, did you review the testimony of Marc Vallen?

A. Yes. I believe I did.

Q. Okay. Do you have any opinions regarding any of the testimony you reviewed so far?

A. That's a really broad question, you know. So is there any way to be a little bit more specific?

Q. Well, let's see, so you mentioned that you reviewed Mr. Comings's testimony. Do you have any opinions as to that testimony?

A. Yes.

Q. Okay. What opinions do you have?

MR. ALEXANDER: Objection. Go ahead if you can.

THE WITNESS: Is there any way that you can be more specific?

BY MR. FISK:

Q. Do you -- are there any portions of his testimony that you -- any portions of his testimony or conclusions that you agree with?

MR. ALEXANDER: Objection. Go ahead.

THE WITNESS: I -- I really need more specificity to respond to -- I mean, I agree he wrote his name, as far as I can tell, properly. I wouldn't have spelled it that way, but apparently he does.

BY MR. FISK:

Q. Fair enough.

So, for example, Mr. Comings, I believe, questioned your CO2 price forecast, correct?

A. Yes, he did. I was struck by the fact that he didn't provide his own forecast.

Q. Okay. Do you disagree with his critique of your forecast?

MR. ALEXANDER: Objection. If we're going to ask about Mr. Comings's testimony, could we use that as an exhibit?

THE WITNESS: Yeah, I'm ready to look at it.

BY MR. FISK:

Q. Okay. We'll get to it. We'll get to

that. It's largely confidential; so it's probably better to cover it in the confidential section. I was trying to see if there's any public stuff we can talk about.

Do you recall your work on the Flint Creek plant in Arkansas?

A. Yes.

Q. Okay. And is that -- my understanding of that proceeding is that you were asked, and you provided testimony, regarding a proposal to retrofit a coal-fired power plant; is that correct?

A. Yes.

Q. Okay. And as that -- part of that proceeding, you basically did an analysis that forecasts the revenue -- the net present value revenue requirements for a scenario where the plant would be retrofit versus other potential scenarios.

A. Yes. That's my memory sitting here.

Q. Okay.

A. A few years ago.

Q. Okay. Can we mark this as Exhibit 1?

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. FISK:

Q. All right. Mr. Rose, you've been handed

an exhibit that's been marked as Exhibit 1 in this deposition; is that correct?

A. Yes.

Q. Okay. And this is the direct testimony that you submitted on behalf of Southwestern Electric Power Company; is that correct?

A. It appears to be, yes.

Q. Okay. And this was produced in response to Sierra Club Set 1-RPD-39 Attachment 1, up in the right-hand corner of the page it's labeled that.

A. I see that.

Q. Okay. Great. If you could turn to page -- let me let you finish flipping through to make sure it appears to be the right document.

A. Thank you.

(Witness reviewing exhibit.)

A. Okay.

Q. Okay. It does appear to be the document; is that correct?

A. It does.

Q. Okay. And this is the redacted version, of course, correct?

A. Yes.

Q. Yes, okay. If you could turn to Page 7,

and there's a header that says "Methodology"; is that correct?

A. Yes.

Q. Okay. And then it says, "ICF uses a four-part assessment to evaluate these options." Do you see that?

A. Yes.

Q. Okay. And the options are the proposal to retrofit the Flint Creek plant versus various alternatives, several of which involve natural gas generation; is that correct?

A. Yes.

Q. Okay. And there's a reference there to "Base Case PVRR." Do you see that on Page 7?

A. Yes.

Q. Okay. And so the first step you did in this analysis was to calculate the present value revenue requirements under base case outlook; is that right?

A. Yes.

Q. Okay. And just so I make sure we're on the same page, what does present value revenue requirements mean?

A. Present value is the discounted sum of

the -- essentially the costs providing electrical energy service related to the -- in this case the generation part of the business.

Q. Okay. So is it that kind of then that cost or repairs of the cost of the proposal versus the revenue that the plant would be expected to generate?

A. Yes. For cash-going-forward cost, I think that's a fair characterization.

Q. Okay. Then if you look down on Page 7, Line 19, there's a reference to "Sensitivity Case PVRR Analysis." Do you see that?

A. Yes.

Q. And then it says that you analyzed the present value of revenue requirements for each option under six alternative scenarios; is that right?

A. Yes.

Q. Okay. And those alternative scenarios looked at potential different prices for natural gas, coal, and CO2; is that right?

A. Yes.

Q. So essentially when evaluating the revenue requirements in the Flint Creek proceeding, you came up with a base case of inputs for your

model, but then also looked at a range of different values for those inputs; is that right?

A. Yes. As it says, the first and most important element is the base case, and the sensitivity analysis is a secondary consideration.

Q. Okay. But those sensitivity analyses, you state on Line 21, are designed to examine long-term average uncertainty in key economic drivers; is that right?

A. Yes, as part of that secondary consideration.

Q. Okay. And do you feel evaluating such uncertainty in key economic drivers is an important part of looking at expected revenues from a generating unit over, you know, the next 15, 20 years?

A. I think what I said here was the principal criteria and the first and most important element is the present value in the base case, but I -- secondary consideration is given to uncertainty, and so that's what we did.

Q. In the present proceeding regarding FirstEnergy, you did not do any sort of sensitivity analyses, correct?

A. That's correct.

Q. Okay. And do you know -- why did you not do any?

A. Well, what we did was the most important element of the analysis, we -- which we used our expected values. While in this case we did use multiple sensitivity cases, sometimes we don't, and we were only asked to do a single case, our base case.

Q. You were only asked by FirstEnergy to do a single case?

A. Yes, albeit a very detailed case involving more modeling tools than was used in this particular case. So there is some tradeoff between detail and the number of cases as a general matter in the work that we do.

Q. Who at FirstEnergy asked you to do only a single case?

A. You know --

MR. ALEXANDER: Objection; misstates prior testimony. Go ahead.

THE WITNESS: We -- when -- we had the earlier discussion in this deposition related to conversations such as I remember them, but we were

asked to provide projections for our base case on a detailed basis, and I believe it was either from Mark Hayden or David Pinter, or one of the people that either I remember or I don't remember their names.

BY MR. FISK:

Q. Okay. Do you -- just to clear up the objection that was stated; so is it your testimony that someone at FirstEnergy asked you to do only a single set of projections as opposed to looking at sensitivities?

A. We were asked to do one highly detailed projection.

Q. Okay. And did you ever recommend to FirstEnergy that they look at sensitivities around the various inputs?

A. I guess what I would say is we always ask clients if they also want sensitivities. Part of that is a scheduling issue, and part of it is because sometimes people have a base case that they want us to run, and sometimes they have a base case and sensitivity cases they want us to run. That's a general procedure that we have.

Q. Do you recommend to your clients that they should look at sensitivities?

A. What I would sort of say is that, everything else being equal, it's better to do more analysis than less, but they need to weigh the fact that depending on the complexity it can be very expensive and time consuming to do a lot of sensitivities, and that the core of the analysis is determining the base case. Because, as we discussed, the NPVRR, the net present value of revenue requirements, is determined on an expected value basis as the discounted cash flow of the base case, and you're using a risk-adjusted discount rate off of a single case. And so it's extremely rare that the sensitivity cases directly affect the actual key decision criterion, which is the NPVRR.

So when we're discussing with clients, we're always pointing out that the actual, if you will, evaluation or critical piece of information we're providing comes only from the base case, but that it's useful to keep in mind that there are different uncertainties that are -- can be explored through the sensitivity case, or as in my testimony, through some of the qualitative discussion that we have.

Q. Okay. And are you aware that in this

proceeding, the proposed transaction would last 15 years?

A. Yes, that's my understanding, to 2031.

Q. Okay. And it's for the companies to buy all of the output from Davis-Besse and Sammis generating stations, plus a small share of the OVEC plants; is that right?

A. That's my general understanding. Again, I haven't reviewed the term sheets or the PPA terminology, they don't all exist, et cetera, but that's my general understanding of the arrangement.

Q. Okay. And would you agree with me that the amount of money at stake in such a transaction ranges in the billions of dollars?

A. Yes.

Q. Okay. And would you -- do you believe it's prudent to make a decision involving 15 years and billions of dollars on the basis of only a single set of projections?

A. I guess what I would say is is that I don't have an opinion necessarily on prudence, but I guess I'm heartened by the fact that the companies came to us to conduct very detailed, sophisticated analysis. And the analysis that we did was not easy

to do, involved two different types of very, very large models, it involved a long period of time and a large range of particular parameters. It was highly detailed, as we discussed earlier, in terms of the specific location and treatment of the topology of the grid. So I'm heartened that the company put that effort in to do that type of analysis.

And I am also sensitive to the fact that our work is not inexpensive; so I don't really have an opinion on prudence, but I would say I'm heartened by the work that the company's done.

Q. For your -- but do you believe it would be reasonable to sign on to a 15-year contract with billions of dollars at stake based on only -- looking at only a single set of projections?

A. I -- you know, I don't have an opinion as to exactly how much information is needed. There seems to be a lot of information that's being generated in this case, and I -- there seems to be a lot of discussion of uncertainty, and I think that that's reasonable and appropriate.

Q. The discussion of uncertainty is reasonable and appropriate?

A. Yes.

Q. Okay. How do you evaluate uncertainty if you've only looked at a single set of projections?

A. Well, you know, the -- as I indicated earlier, the uncertainty is reflected in the discount rate, and so a part of the uncertainty is directly affecting the analysis. So present value revenue requirements is based on only two pieces of information; the base case and the discount rate.

The sensitivity analysis is used to understand uncertainty, which can be done qualitatively and through some of the calculations that other people are attempting to do. And I don't think that there's a single one-size-fits-all type of approach, but I do think that this is -- the work that we did is an important part of the -- of what's helpful to make these type of decisions.

Q. You said the uncertainty is -- is addressed in the discount rate; is that correct?

A. Yes.

Q. And how is that addressed through the discount rate?

A. So the discount rate is determined based on the risk-free rate, plus the risk-adjusted add-on to the risk-free rate, which is a function of the

risk of the activity. So that follows from the capital asset pricing model, which is the principal theoretical basis for discount rate determination. And the principal analytic procedure, as we discussed earlier, is the present value of revenue requirements, which takes into account the risk-adjusted time value of money.

Q. So how does the risk-adjusted add-on work?

A. You take the beta of the activity, which is typically reflected as the covariance of the company's stock price and that of the market, divided by the variance of the stock market, times the market premium for equities, plus the risk-free discount rate gives you the total discount rate.

So the beta is a measure of the, what's called, systemic risk, and that's how we bring together a base case into a -- or expected value case into an expected net present value.

Q. Okay. Without getting into specifics of numbers, because that's -- those are confidential, but it's my understanding, for example, that you're projecting that capacity prices are going to increase, correct?

A. Yes.

Q. Okay. And capacity prices play a major role in determining what the projected revenue from the plants at issue will be over the next 15 years; is that correct?

A. It plays a major role, but it's distinctly subsidiary to the electrical energy price.

Q. Okay.

A. So, for example, the firm energy price is typically 80 percent electrical energy and 20 percent capacity and equilibrium, just very rough figures.

Q. Okay. So energy prices, you also are projecting that those are going to increase, correct?

A. Yes.

Q. Okay.

MR. ALEXANDER: Before you ask your next question, if we can just keep it at that level and then save the rest for --

MR. FISK: Yeah, yeah, yeah.

MR. ALEXANDER: Okay.

MR. FISK: And let me know if anything's confidential, but I won't say any numbers.

BY MR. FISK:

Q. Would you agree with me that there is uncertainty as to what energy prices will be in the future?

A. Yes.

Q. Okay. So your projection is not -- you're not telling me that it's guaranteed that's what energy prices are going to be in 2026 or something?

A. No. What I'm saying is that that's the expected value of what I think prices will be in 2026.

Q. Okay. And if prices are different than the expected value you used, that would lead to -- all else being equal, that would lead to a different net present value revenue requirement for the plants at issue, correct?

A. Yes.

Q. Okay. So if the energy prices are higher, you're probably going to have a more positive net present revenue requirement for ratepayers, correct?

A. Right. Or a higher present value for revenue requirements.

Q. Okay. And if energy prices are lower

than what you've projected, then you're going to have a lower net present value, correct?

A. Yes, as I understand the arrangement, yes.

Q. Okay. And so how -- if you're not looking at and you haven't analyzed a lower or a higher energy price, then how are you assessing the impact of that uncertainty on ratepayers?

MR. ALEXANDER: Objection; beyond the scope of his testimony. Go ahead.

THE WITNESS: In looking at the future projections of prices, we have presented historical information, we've presented forward-price information, we've presented our forecast, we've presented our discussion of what are the critical drivers and what are the -- what are the critical uncertainties in that regard.

I think that that's all part of the information that needs to be considered, and I think it's -- again, it's an important part of the information that needs to be considered is what I understand evaluating this larger issue of how to and whether to hedge the uncertainty in the marketplace.

BY MR. FISK:

Q. Okay. I guess I don't understand, how does the potential for a higher or lower energy price get evaluated if you've only looked at a single energy price projection?

MR. ALEXANDER: Same objection.

THE WITNESS: Again, people are -- they're looking at historical information, forward information, they're looking at our projection, they're looking at the factors that are important for determining what's likely to happen. And I think that that's all useful information, and I think I said that before.

BY MR. FISK:

Q. So the fact that other parties in this proceeding are looking at uncertainties is useful information?

A. Yes. And the fact that we discuss uncertainties and provide additional information other than our forecast I think is also part of the process, and I do think that the information provided is an important contribution.

Q. If you look at your testimony, Page 4, Lines 9 through 11, there is a discussion there regarding, in your words, unanticipated developments

which have lowered prices over the last few years. Do you see that?

A. Yes.

Q. What do you mean by "unanticipated"?

A. This is related to what I was indicating before, we did discuss uncertainties in the marketplace and identified what those critical ones are. There were developments that were different than our expected values from I would say a period of, say, five or six years ago.

Q. Okay. So if we had been sitting here, say, in 2007 and projecting future energy prices, are you saying those projections likely would not have foreseen the developments that you've listed on Page 4, Lines 12 through 22, of your testimony?

A. Yes. In the sense that, for example, we believe that there's going to be cycles in the marketplace, but we wouldn't have anticipated that the most -- the largest recession in 70 years would occur two or three years down the road.

We didn't -- we anticipated some improvement in the technology of gas, for example, as I indicated in the second dot point, but not to the extent that it had occurred. We project, based on

average weather conditions, that there were some very warm winters that affected market conditions, et cetera.

So there have been developments that were not included in our expected case to the extent that it turned out to be the case.

Q. And is it fair to say that those unanticipated developments led to a lot of the projections made, you know, say, in 2007, 2008, to simply be wrong?

MR. ALEXANDER: Objection. Go ahead.

THE WITNESS: We're very -- I'm very specific here in highlighting the uncertainty of projections by indicating that prices have been lower than anticipated, albeit -- and I think it is fair to say different than what we projected because of these specific developments.

BY MR. FISK:

Q. Okay.

A. And I indicate later that some of these developments are not ones that we would expect to continue and, therefore, that's why our projection is what it is.

Q. Okay. And do you feel that it is --

there's a potential for unanticipated developments over the next 15 to 20 years during -- over which you've projected energy prices in this proceeding?

A. Yes. I do think that there are -- they may be, and I believe different than the ones that we've had the previous five years. But as I indicated here in my deposition and throughout the testimony, there is significant uncertainty and variability in prices both in terms of multi-year periods and then in terms of shorter-term periods ranging from day to year, annual volatility, which is an important part of the testimony as well.

Q. And those unanticipated developments could lead to prices being lower or higher than what you've projected?

A. Yes. They could also -- we're projecting an expected value, which is a probability weighted; so it explicitly takes into account that they could be higher or lower. And we're indicating that we're forecasting particular parameters, for example, average conditions. We're not forecasting explicitly the volatility, but that we believe the volatility is an important aspect of the marketplace, and here I'm referring to the daily and annual

volatility that occurs in prices.

Q. Okay. We can mark Exhibit 2.

(EXHIBIT MARKED FOR IDENTIFICATION.)

(Discussion held off the record.)

(Recess taken.)

BY MR. FISK:

Q. All right. Mr. Rose, you have been handed an exhibit marked Exhibit 2; is that correct?

A. Yes.

Q. Okay. And this document is an ICForecast: Executive Energy Outlook - Data Tables; is that correct?

A. Yes.

Q. Okay. And I'd like to first clear up a little bit of confusion here. When we printed this document, there was a header at the top up here that refers to this as the Integrated Energy Outlook for 2013, Quarter 4, but then throughout the document itself it states "ICForecast Quarter 3 2014." Do you see that?

A. Yes.

Q. Okay. Do you know which one this is?

A. I believe it's the Q3 2014.

Q. Okay. And this document was produced in

response to OCC Set 7-RPD-66 Attachment 1-a.

And can you tell me generally what this document is?

A. Yes. It's a subscription service forecast of various different energy market parameters.

Q. Okay. And ICF --

MR. OLIKER: I'm sorry, can I have a clarification? Is this document titled "ICForecast: Strategic Energy Outlook, Q3 2014," and a 70-page document?

MR. FISK: No. It's entitled "ICForecast: Executive Energy Outlook-Data Tables," and it was produced in response to OCC RPD-66 Attachment 1-a.

MR. OLIKER: Okay.

BY MR. FISK:

Q. And ICF produces these energy outlooks on a quarterly basis; is that right?

A. Yes.

Q. Okay. And do you know -- so if this is Quarter 3 2014, do you know approximately when this document would have been created?

A. Approximately Quarter 3 2014.

Q. Well, I mean, September, are we talking? I mean, when?

A. I -- I don't know specifically. It was, you know, sometime in the third quarter.

Q. Okay. And looking on the very first page, there's a discussion there that says that the "Executive Energy Outlook now includes price projections for Reference, High and Low cases for all of the covered markets"; is that correct?

A. Yes.

Q. Okay. And so the reference case, according to the second paragraph on the first page, is based on fundamentals -- a fundamentals-based analysis of natural gas and power markets; is that correct?

A. Yes.

Q. Okay. And then you say, "The High Case and Low Case...are based on confidence intervals around those Reference Case values derived from prior analysis"; is that right?

A. Yes.

Q. All right. And would you agree that the high and low cases represent a reasonable range of prices around the reference case?

A. Yes, with the caveat that it's fundamentals-based, and we're not varying things like weather which is an important short-term determinant of market prices and for gas.

Q. Okay. So did you know what goes into determining high and low cases?

A. Yes. In general there is indicated fundamentals based, and that refers to supply and demand variations that are specific to the gas industry typically. They're not economic cycles or, as I indicated, weather. It's things like productivity of various different gas-producing technologies and the parameters that determine the level of gas demand.

Q. Okay. This document, just flipping through the pages, also includes high and low cases for coal prices and energy prices, correct, or on-peak power prices, I should say?

A. Yes, for -- yes, includes energy. It's electrical energy.

Q. Okay. Do you know how the on-peak power price high and low cases were developed?

A. Primarily they reflect the high and low fuel price cases that are being developed. I don't

remember if there's additional parameters that are being varied.

Q. Okay. So the high and low on-peak power price cases come out of the high and low natural gas price projections?

A. Yes. They're correlated; that is, the input sets that are creating the high on-peak power price or the high gas price case and the high coal price case, and those right now are the ones that I remember. I don't know that there's any other parameters varied.

Q. Okay. So -- and let me make sure I got this right. So you -- the power price projection comes out of the IPM model; is that right?

A. Yes.

Q. And so for the base -- or the reference case power price projection, you would use the reference case natural gas prices and input; is that right?

A. Yes.

Q. And then when you want to do the high power price case, you would then use the high natural gas price projection as the input?

A. Yes.

Q. Okay. And there may have been other inputs that changed, but you're not sure?

A. Well, I think the coal price also changed.

Q. Okay.

A. And those are the main ones sitting here that I remember, and they may be the only ones.

Q. Okay. And do you know how the high and low coal price projections are created?

A. Similar to the gas price projections, because they're fundamentals based. That's parlance for we're not varying the weather or the -- including economic cycles, but what we're varying is things like coal mining productivity and demand conditions in the coal industry.

Q. Okay. So would you agree the high and low cases reflected in Exhibit 2 are designed to take account to -- for some of the uncertainties around the reference case projections?

A. Yes.

Q. Okay. So if you did not do those high and low case projections that are reflected in Exhibit 2, you wouldn't take account of those uncertainties; is that correct?

MR. ALEXANDER: Objection. Go ahead.

THE WITNESS: You know, as indicated, the previous versions of this did not include the high and low cases. We've always, you know, discussed the uncertainties in the marketplace. It would be -- in those discussions, they were more qualitative. Here we have a partial quantitative treatment of the uncertainties.

BY MR. FISK:

Q. Okay. So without those high and low cases, you would not have a quantitative assessment of those uncertainties in your reference case projection, correct?

A. No. We discussed earlier that the uncertainty is reflected in the discount rate, and that the principal activity of economic assessment is to assess the expected or probability-weighted value of the projection, taking into account when you're doing the present value the risk-adjusted discount rate.

Q. So then why do a high and low case?

A. It provides additional information that is informative of the uncertainties that would otherwise be discussed qualitatively in the material

or represented in the risk-adjusted discount rate that would be used.

Q. But the risk-adjusted discount rate is leading to a different result than your high and low cases, correct?

A. The -- there's no result without the parameters, the forecast and the discount rate in terms of present value, you have to have both, and, if you will, the numerator and the denominator. The sensitivity cases typically are not directly used to calculate the expected value, which is the most important parameter.

Q. Okay. Does the risk-adjusted discount rate that you use in your reference case change for your high or low case?

A. If we were to discount those cases, we would not change the risk-adjusted discount rate. What you are doing is creating a probability-weighted expected value, which is our base case, and then you're using the risk-adjusted discount rate. We don't typically assign specific probabilities to the high and low case and then calculate the expected value.

Q. Okay. But if -- if FirstEnergy had

wanted a high and low gas price projection, ICF had one that they could have provided, correct?

A. Yes. We would have done the analysis.

Q. Well, you have one right here in Exhibit 2, correct?

A. Yes. Although at the time we did the analysis in August, it was based on what we had at the time. This, as you can see, is indicating that there's a change to the particular outlook. We always were in a situation where we could do sensitivity cases for gas, it's just we have some elaboration here on what the sensitivity cases are.

Q. Okay. But your gas price projection that you provided to FirstEnergy came out of your quarterly outlook, correct?

A. Yes.

Q. Okay.

A. It was the Q2 outlook.

Q. Okay. So if you had a Q2 high and low case, you could have simply provided those high and low cases to FirstEnergy, correct?

A. If we had, which I don't believe we did. We did not have that in this document, but we could have provided low and high gas prices, yes.

Q. And are you confident that the risk-adjusted discount rate accounts for all of the uncertainties that are reflected in the high and low cases?

A. What I'm confident is that the risk-adjusted discount rate reflects the uncertainty of being in the power business, particularly the wholesale power business, the risks -- principal risk being the range of commodity price outcomes that you could have.

Q. It accounts for all of that risk?

A. It's taking into account all of the -- what they call systemic risk of being in the power business, yes.

Q. Okay. But there are other risks that are then addressed through a high and low case, correct?

A. No. The systemic risks are the risks that are relevant to the discount rate, and it's related to the capital asset pricing model theory. Among those risks and the principal risks are the uncertainty in the commodity.

Q. But if you do a risk-adjusted discount rate assuming to get different underlying energy

price, you're going to get a different result, right?

A. If we have a different expected value, different base case --

Q. Yes.

A. -- we will have a different result. If we have a different sensitivity case, in general we don't have a different expected value and a different present value of costs or revenues, or whatever we're measuring.

Q. Well, but you have -- you don't -- you haven't done that analysis here; so you don't know that that's true here, correct?

A. No. We presented our expected value, our probability-weighted value, our base case, and we've provided that information and it's available for discounting. That's the critical information that's necessary to assess the -- the expected value. That's the main criterion that people are using for making assessments, and so we're taking that into account.

Q. Okay.

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. FISK:

Q. Before we turn to Exhibit 3, you stated

earlier, I believe, that it would be costly to have provided sensitivity cases to FirstEnergy; is that correct?

A. Yes. Everything else being equal, the more cases that you're on, the more costly it is, particularly if you're doing a sophisticated analysis like we did.

Q. Do you know approximately how much it would have cost to give a high and low gas price to FirstEnergy?

A. The inputs or the outputs? I'm not sure what you mean by the low and high gas.

Q. Well, you gave them a base case gas price projection, correct?

A. Yes.

Q. Okay. And as we discussed in Exhibit 2, ICF also has a high gas price projection and a low gas price projection, correct?

A. Yes.

Q. Okay. To provide -- provide a similar high gas price projection and low gas price projection to FirstEnergy with respect to this proceeding, what would that have cost?

A. You mean all the power and related

projections?

Q. Yes, the gas, energy price, capacity price.

A. That's commercially proprietary. I mean, we should address that later.

MR. ALEXANDER: Yeah.

BY MR. FISK:

Q. Okay. When you provided additional projections to -- or, additional sensitivities to the client in Flint Creek, that would have cost them extra money; is that correct?

A. Yes. But as we discussed, they were doing a different type of analysis. The market wasn't nodal, and they didn't -- so there wasn't -- we didn't have to use multiple models like we had to use here.

Q. So you were able to create high and low projections without additional modeling in that case?

A. No. There was additional modeling, but there was less modeling in time, et cetera, than would have been involved if we attempted to reproduce this case with multiple input assumptions. I have multiple scenarios that was -- because we were not using GE-MAPS and IPM together and also GMM, the gas

market model, we were using only IPM at the time, and it's in part related to the fact that market was not nodal at the time.

Q. Okay. So but it did cost them extra money to be able to get those sensitivity inputs, correct?

A. Yes, it did.

Q. Okay. And your testimony I believe earlier was that uncertainties around those -- around inputs is -- is adequately addressed by the discount rate; is that correct?

A. Yes. The principal result of our analysis is the expected value -- the probability-weighted value, and it's discounted with a risk-adjusted discount rate, and that's the principal decision criteria. The other analyses or other considerations are qualitative in nature.

Q. So basically the money that the client in that case spent on getting sensitivity analysis was wasted money?

MR. ALEXANDER: Objection.

THE WITNESS: No. I didn't say that, and I don't think that that's the case. It's just if you're asking how you do the analysis, as I

indicated, the principal result, as I indicated in that testimony and I'm indicating here, the principal result is you're taking the expected value, the base case, and discounting that. And that's what we did here and that's what we did there, but there we also did additional sensitivity cases. Here we discuss the uncertainties on a qualitative basis and did more detailed analysis than the base case.

BY MR. FISK:

Q. So what was the value to the client in the Flint Creek case of getting those additional sensitivity analyses?

MR. ALEXANDER: Objection. Go ahead.

THE WITNESS: You know -- you know, we -- we were instructed to do the analysis. When we did that, I think that it gives them some additional information about the uncertainties and the parameters that are addressed in those sensitivity cases.

BY MR. FISK:

Q. Okay. Turning to Exhibit 3 that you've been handed. This is a document published by ICF called "Return of the RTO"; is that correct?

A. Correct. ": Auction Results Portend

Recovery."

Q. And you are listed as one of the authors on this document; is that correct?

A. Yes.

Q. And I assume you've seen this document before?

A. Yes.

Q. Okay. And if you look at the very first page, the first paragraph under Executive Summary, the last sentence, it says, "ICF expects capacity prices will follow a general upward trend in future auctions, but the extent and rate of the increase (and volatility around the generally increasing trend) is more difficult to predict." Do you see that?

A. Yes.

Q. Okay. Do you agree that the extent and rate of the increase of capacity prices is difficult to predict?

A. I stand by what we said, it's more difficult to predict than the general upward trend or the expected value, and -- but, you know, I think the way it's written here is the best description in my view.

Q. So would you agree that there is uncertainty regarding future levels of capacity prices?

A. Yes.

Q. Okay. And would you agree that such uncertainty could be accounted -- at least partially accounted for by looking at a high and low capacity price projection as opposed to just a base case?

A. You know, as we discussed earlier, you know, we -- I feel like we've addressed the issue, but we typically are doing base case results. And we're discussing here, we use the word expects, which is -- means mathematically you're taking the probability-weighted value, and it's our base case and that's sort of what we're doing here. You know, I think that that's the most important and the main criterion for evaluating -- making decisions in this business.

Q. When you -- if you go back to the -- the -- well, maybe you remember just before referring to the document, but in the Flint Creek testimony, my understanding is that the net present value revenue requirement figures came out of modeling done through the IPM model; is that correct?

A. Yes.

Q. Okay. And is that an hourly dispatch model?

A. It's an hour-type dispatch model.

Q. What do you mean by that?

A. The 8,760 hours map to -- map to different hour types; so it might be a particular season's peak hours or a portion of the peak hours. These are called load segments. And the model is solving for the marginal cost of meeting that level of electrical energy demand, and once you have done that, then you can map it back to the 8,760 hours. So you can create an hourly distribution based on the hour types. It's a technique to reduce the computational intensity of the -- of the analysis so that you can do other types of analyses.

Q. Okay. So you -- you get an hourly projection of energy prices, correct?

A. Yes.

Q. Okay. So for every -- for all 8,760 hours, you have different prices for energy?

A. Yes. But of those 8,760, there would be a bunch that mapped to a specific hour type and therefore have the same price.

Q. Okay.

A. So you wouldn't have 8,760 different prices, but you would have for each hour a price, and sometimes it would be the same as another hour and obviously a lot of times it would be different.

Q. Okay. And then your model then compares the operating -- the variable operating costs of whatever unit you're looking at to those hourly segments; is that right?

A. Yes. In addition to other operational constraints, which making that comparison, determining marginal costs, operation, dispatch, various different parameters.

Q. Okay. So is this hourly -- or, these hourly segments, that would be different than, say, looking at, say, a monthly dispatch, correct?

A. If in the month you're just -- I mean, I'm not sure exactly what you mean by that. If you say month is, like, at one price, that would be different. Sometimes our assumptions are monthly, sometimes they're seasonal, sometimes they're hourly, it varies.

Q. Okay. So the hourly segments that you're talking about is, for example, you're looking

at weekday on-peak, weekday off-peak, weekend, is it that sort of thing?

A. In IPM it's similar to that, but we may have additional disaggregation. So the industry standard for on-peak is usually 16 hours a day, and we may be breaking that up into multiple segments in the IPM model.

Q. Okay. Did you do any sort of a breakup of energy prices into these segments for FirstEnergy in this proceeding?

A. Yes. The model has the logic to implement that breaking out.

Q. Okay. So the data -- so the energy price projections that you provided to FirstEnergy -- I guess I'm confused. I thought earlier you said that it was an hourly projection.

A. No. As described in the testimony, the first 10 years are coming from the MAPS model primarily.

Q. Yeah.

A. And the second 10 years is coming primarily from the IPM model.

Q. Okay.

A. But both models are using inputs or

information from the other model. And that's why, as I indicated, it's a more complex analysis than the work that we did for SWEPCO. And that's in part related to the fact that the market here is different than the market there was at that time.

Q. Okay. I guess maybe I'm -- I was unclear there. I'm not -- I've not talked about what went into how you did the analysis, that will be the afternoon session, I'm sure that's confidential, but I'm talking about the format that you provided energy prices to FirstEnergy in.

My understanding earlier was that you provided hourly data; so all 8,760 hours per year, you gave them an energy price. But I thought, and I could be wrong, that you're now saying that you gave them these figures in low hourly segments?

MR. ALEXANDER: Objection; compound.

THE WITNESS: What we provided to the client included the hourly prices. What we've been discussing is the methodology by which we're determining the hourly prices, and that methodology is in the case of the IPM model hour types.

BY MR. FISK:

Q. Okay. But you did not provide to the

client in this proceeding the data broken down by hour types, is that right, the energy price data?

A. No, I don't believe so, no.

Q. Okay. So if -- if FirstEnergy in their modeling used energy prices based on hourly segments or hourly types, they -- that was something they would have created?

A. Yes. That's my understanding.

Q. Okay. Do you know if they did that, if they created such data?

A. I believe they did.

Q. Okay. Were you involved in the creation of that data at all?

A. No.

Q. Okay. Do you know who at FirstEnergy created that data?

A. You know, it might be Jason, I'm not really sure, Jason Lisowski. I'm not really sure, but it may be him. I don't know.

Q. Okay. Did you provide any advice to FirstEnergy as to how to create such data?

A. No. I don't believe so.

Q. Okay. And have you reviewed at all the hourly load -- hourly segment energy price data that

FirstEnergy used in its modeling?

A. No.

Q. Okay. In looking at Page 3, Lines 7 to 19, of your testimony, you explain that you have, in your words, testified extensively on a number of issues related to the power sector; is that correct?

A. Page -- could you repeat the --

Q. Page 3, Lines 7 to 19. I was actually quoting from Line 14.

A. Yes.

Q. Okay. Have you ever submitted testimony relating to the power sector on behalf of a consumer advocate?

A. Does a Public Utilities Commission staff, is that what you're referring to, or just the -- a different group than the staff?

Q. I was referring to a different group. So, you know, like, there's Ohio Consumers' Counsel, there's, like, a designated advocate for consumers or ratepayers in many states.

A. You know, I have a lot of testimony here. What I do remember is I've testified for a Public Utilities Commission, but I -- and other stakeholders that could be argued to support

consumers, but I don't remember specifically a Consumers' Counsel.

Q. If you had, it would be listed in your resume; is that correct?

A. Yes.

Q. Okay. But you can't -- can't correlate -- recollect testifying on behalf of a consumer advocate, correct?

A. One second.

MR. ALEXANDER: Let me clarify. By "consumer advocate," you mean a statutorily created consumer advocate similar to the Ohio Consumers' Counsel?

MR. FISK: Yes.

MR. ALEXANDER: Okay.

THE WITNESS: Right. Not for, like, a statutorily created entity other than the Public Utilities Commission or individual consumers.

BY MR. FISK:

Q. Individual consumers?

A. Right.

Q. You have represented?

A. Yes.

Q. Who is that?

A. I'm representing a large industrial consumer in Oklahoma in a case that's ongoing right now.

Q. Okay. Anyone else?

MR. ALEXANDER: Take your time.

BY MR. FISK:

Q. Yeah.

A. A large aluminum smelter. I can't recall any others.

Q. Okay. You identified two industrial customers, correct?

A. Yes.

Q. Okay. So no -- have you ever represented any residential ratepayer advocacy groups?

MR. ALEXANDER: Objection to the definition of residential ratepayer advocacy groups.

BY MR. FISK:

Q. Let's start with, well, the statutorily created entities in many states.

A. I mean, obviously the Public Utilities Commission staff is a statutorily created entity. I've -- when you say "represented," I was just looking at my list of testimony, I think -- you know,

I looked at the list of clients that would include others, but I can't here sitting remember any, but, of course, we've also represented environmental groups, and there may be not somehow -- I don't know exactly what they are.

We've represented various different stakeholders, but not, like, individual ratepayers. I can't remember in testimony any Consumers' Counsel that I personally have done.

Q. Okay. When you said "we have represented environmental groups," were you referring to yourself personally or ICF as a whole?

A. Both.

Q. Both. What environmental groups have you represented?

A. NRDC, I think that's public; Sierra Club, although I didn't do most of the work in that analysis. So it's a pretty broad spectrum of entities, some of which are -- I can't think of any testimony for a Consumers' Counsel entity.

Q. Have you done testimony for any environmental group?

A. Well, I mean, like, the Department of Environmental Regulation or something like that, but

in terms of, like, a third-party, nongovernmental entity?

Q. Right.

A. As a firm, our number one client is the Environmental Protection Agency, but I don't think I've testified for an environmental group.

Q. Okay. And with regards to the EPA, does the Energy Advisory Services group at ICF ever represent EPA or do work for EPA?

A. Yes, but -- yes.

Q. Okay. Have you personally?

A. Yes.

Q. If you could turn to your testimony, Page 9, Lines 17 to 18. You have a sentence there that says, "As power plant earnings in the energy markets increase, capacity prices generally tend to decrease, and vice-versa"; is that correct?

A. Yes. That's what it says.

Q. Okay. And you agree with that statement?

A. Yes. I mean, it's an everything-else-being-equal type of statement, yes.

Q. Okay. And that's because capacity markets generally are supposed to provide

supplemental revenue when your energy sales are providing insufficient revenue for generation sources; is that correct?

A. Yes. It's a necessary mechanism because of price caps on the -- in the energy market that you have to have a -- I would say complementary, but it's also supplemental market to compensate for the energy price caps and the -- that exist in the energy market, electrical energy markets.

Q. Okay. So how is that -- this statement about as power plant earnings and the energy markets increase, capacity prices generally tend to decrease, how is that consistent with your projection in this proceeding that both energy prices and capacity prices are going to increase over the next 20 years?

A. Well --

MR. ALEXANDER: I'm going to caution you to only answer to the extent you can in the public version of the transcript. And if you think you need to go to the confidential version, let's wait and do this answer and question there.

BY MR. FISK:

Q. Right.

A. I would just first say in general that

this is one of the relationships that exist between energy and capacity, and there are other drivers of energy and capacity prices.

So, for example, if you have excess capacity, you'll have -- and that is somehow eliminated, say, for example, through environmental regulations, and the environmental regulations may also be factors that are increasing the electrical energy price, you could have a simultaneous increase in capacity and energy markets. So there are many factors that are involved, and that's why it's necessary to do the computer modeling that we did, which is an integrated assessment of energy and capacity.

Q. So in that integrated modeling that you did, did your projected increase in energy prices put any downward pressure on your capacity price projection?

A. Everything else being equal, it did, but there were, again, many different determinants of both energy and capacity, and that was taken into account in the integrated modeling.

Q. Okay. And how was that taken into account in the integrated modeling?

A. The -- the capacity price is the shadow price of the capacity constraint in the marketplace; that is, the marginal cost of meeting your capacity requirement. That shadow price or marginal cost calculation is taking into account the marginal capacity sources, energy earnings, as well as other factors. And so it is taking into account all of the things that are determining the capacity prices, including the energy prices, and vice-versa. It's a simultaneous determination in the IPM model.

Q. And in terms of your projection --

MR. ALEXANDER: Could someone please mute their phone? We heard some banging.

BY MR. FISK:

Q. In your projection of higher energy and capacity prices, one factor that you identify is causing those increases is the demand growth; is that correct?

A. Yes. It has a number of different implications, but in general the increase in demand, everything else equal, in this particular market price increases the electrical energy prices and can increase also the capacity prices. But, again, there are multiple factors that are determining things.

Q. Sure. So would you agree that all else held equal, if growth and energy demand is lower than what you're projecting, that would tend to reduce the increases into energy and capacity prices that you're projecting?

MR. ALEXANDER: Could I have that question reread, please?

(Record read back as requested.)

THE WITNESS: Yes. But I would have to run that through the model to be sure, because there are circumstances in which the higher energy demand leads to a higher demand for electricity, leads to more additions of new power plants which may be more efficient and have lower costs than the existing plants.

So I'd want to make sure that over the time period that -- that all the effects, including the movement up the existing supply curve, which tends to increase the prices certainly in the electrical markets, is off -- is taking -- all the offsetting effects are. It's a complicated relationship, in particular over the long term when you can adjust your capital stock.

BY MR. FISK:

Q. Okay. So to be sure what the impact of, say, lower peak and energy demand, you would need to rework the model with that as a different input?

A. Yes. But having said that, it depends on sort of the time period. The areas where the effects are the most offsetting, if you will, are in the long term, which you have, as I indicated, adjustments to capital stock and also adjustments to capacity prices, which tend to move different than -- and tend to offset the effects of the energy markets, all else being equal.

Q. Okay. Okay.

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. FISK:

Q. I've handed you, Mr. Rose, an exhibit marked Exhibit 4; is that correct?

A. Yes, sir.

Q. Okay. And this is the companies' response and supplemental response to Sierra Club Set 1 - Interrogatory 28; is that correct?

A. Yes.

Q. Okay. And the request refers to Page 19, Line 20, through Page 20, Line 2, of your testimony; is that right?

A. Yes, in Figure 4.

Q. In Figure 4, yes, okay.

And the referenced portions of your testimony discuss energy demand growth and your belief that it will contribute to increases in capacity and energy price increases, correct?

A. Well, let's take a look at that.

Q. Okay. Sure.

A. If you could read back the question.

MR. FISK: Could you read back?

(Record read back as requested.)

THE WITNESS: Yes. What I'm discussing here is the short-term situation in which the capital stock is fixed, the stock at power plants is fixed, and I'm talking about as the economy continues to recover that's the current situation that the economy's in, the short-term assessment.

The other is is that I think the -- what we're really referring to is Figure 2, not Figure 4. So I think there's a mistake in the interrogatory, because Figure 4 is not really related.

BY MR. FISK:

Q. Okay.

A. Figure 2 is highlighting the near-term

nature of the analysis and the existing and fairly static supply curves.

Q. I think that's a fair correction to the interrogatory.

A. It may not only be in the interrogatory, but just for clarity, what I was referring to was the Figure 2.

Q. Okay. So is it your testimony that projected demand growth has any impact on the long-term energy and capacity price forecast, or is it more just a short-term issue?

A. I guess the effects are more or less ambiguous in the immediate term. In the long term, as I indicated, there are more offsetting factors, and I'd have to run the model to know.

Q. And when you say "short term," what timeframe are you referring to?

A. The next, you know, one to five years.

Q. Okay. And long term is?

A. Beyond five years. I mean, there could be a medium term.

Q. Sure.

A. But for simplicity here just, I think, you know, long term is really in the period of time

in which the capacity stock and the prices are able to adjust freely.

Q. Okay. Would you -- would you agree that as a general matter short term -- projects in the short term are likely to -- strike that. Let me start over.

Would you agree that as a general matter, the short-term portions of a projection of, you know, energy price or capacity price, et cetera, is likely to be more accurate than the long term?

A. Yes, but with the following explanation.

So it's true that in the near term you have a better sense of what's likely to happen than you would have in the long term, but when you do a long-term analysis you have the law of large numbers working for you; so you have basically an averaging effect that comes into play.

So if someone said, "Is there more variability in a short-term forecast, like, next week or next month," it could actually be higher variability even though you have a better sense of the insight because you don't have the law of large numbers working for you. So, for example, in long-term forecasts you have sometimes it's hotter

than normal, sometimes it's colder than normal, et cetera, and that tends to average out and it makes the forecasting more accurate.

Q. Okay. But overall the short term is generally more accurate than the long term?

MR. ALEXANDER: Objection; asked and answered. Go ahead.

THE WITNESS: Yeah. I would stand by my previous response.

BY MR. FISK:

Q. Okay. Does a long-term projection provide more opportunity for unanticipated developments such as we were discussing earlier?

A. Yes, of a certain type; that is, it's less likely that we would have hotter-than-average conditions in the long term. So in that case it goes the other way, because over the long term you're averaging multiple years. And so you're just not going to have hotter than normal or the colder than normal, it's going to be pretty close to normal, and this is the law of large numbers. But at the same time there are developments that can't be foreseen, and that uncertainty increases over time.

Q. Okay.

A. So there's many things that are going on when you're doing the forecasting. And so I think I'm answering the question, but I'm not 100 percent sure. If you want me to -- maybe read back the question.

MR. FISK: Could you read back the question?

(Record read back as requested.)

THE WITNESS: Again, yes, I think earlier we were talking about things like exactly what the state of the economy is, but there is the averaging effect that you get on the long term that is an important factor that you don't have in the short term.

BY MR. FISK:

Q. Okay. Looking back at Exhibit 4, Subsection c. requested identification and percent or amount of the size of the impact that you expect demand growth to have on energy prices and capacity prices; is that correct?

A. I'm sorry, could you repeat the question?

(Record read back as requested.)

THE WITNESS: Yes.

BY MR. FISK:

Q. Okay. In your response you state that you have not performed any such analysis; is that correct?

A. Yes.

Q. Okay. So you're not able to tell me kind of the magnitude of the impact of your expected demand growth on your energy price and capacity price forecast; is that correct?

A. I have not done an analysis that varies the demand growth and, therefore, I can't isolate that individual parameter; however, the forecast does take into account the expected demand growth that we have in the analysis.

Q. Okay. But if you were to do an analysis that varied the demand growth, you could then get a sense of how much of the factor the demand growth is in your projections of energy and capacity price increases?

A. Right. I read the question to request a partial derivative, a change in the forecast with respect to a change in a specific parameter, and we hadn't done that. And so I could get the information that a partial derivative would provide, but I -- the

forecast does have demand growth in there, but it doesn't -- I don't -- I haven't done an analysis of every parameter -- of course, there's millions of them -- and the demand growth itself is varying by location.

So there's a certain ambiguity in the term demand growth that would have further compounded the difficulty of providing a quantitative estimate. We'd have to have it for what time period and in what geographic distribution.

Q. Well, you used a specific demand growth projection in your modeling, did you not?

A. Yes. But it was a -- a matrix, you know, of year and location, and demand growth is not the same for every location.

Q. Right. But I guess I'm saying if you varied to that -- the demand growth numbers that you used, assuming a different level of demand growth for the year and location that you used, you could then assess how important demand growth is to your projections of energy and capacity price increases, correct?

A. If I did that in -- in determining how important it is, I might have to do that for other

variables as well; that is, if I vary the demand growth, I can see what the effect of the varying of the demand growth is. To determine whether it's important or not, I would want to look at I guess a lot of variables.

So -- but if someone's just asking if they can define what the demand sensitivity case is and the scope, et cetera, then I could do, like, a partial derivative and figure the impact of that.

Q. Okay. Okay. And you used -- in your modeling, you used as an input the PJM's 2014 demand growth forecast; is that correct?

A. Yes. Let me just double-check.

Q. I believe it's on Page 51, I believe, of your testimony.

MR. ALEXANDER: What page is that?

MR. FISK: I believe 51.

THE WITNESS: Yes, I see that.

BY MR. FISK:

Q. Okay. And it said "PJM RTO Zone Demand Forecast." What does that mean?

A. So this is a summary table. The details are provided in the workpaper. But PJM RTO zone is a -- I believe this is for the total PJM, and what's

calculated as an average is indicated.

Q. Okay. So this is for PJM as a whole as opposed to, say, the ATSI zone?

A. Correct.

Q. Okay. Why did you use PJM as a whole rather than the ATSI zone?

A. We did both. That is -- this is just a summary, and the actual details year by year and location by location were I think provided in the workpapers.

Q. Okay. So in your modeling that led to your gas and energy price forecast, you used -- which demand group -- demand forecast did you use?

A. I used the PJM 2014 load forecast, but that is, itself, disaggregated by time and by location.

Q. Okay.

A. So that's why I was just wanting to be precise in the earlier answer that we're using demand growth numbers that are varying by year and by location, and we're just trying to summarize those here for expositional purposes.

Q. Okay. So the demand growth used to, say, evaluate energy prices with regards to the

Sammis plant, it would have been -- a relevant number would have been the number for the zone that the Sammis plant is in as opposed to the RTO as a whole; is that right?

A. It would be most relevant or more relevant most likely what the demand is, you know, hour by hour, et cetera, in the zone where the particular plant is located.

Q. Okay.

A. But the analysis is also affected by the demand conditions and other conditions in other regions as well.

Q. Okay.

A. So it's a simultaneous determination of pricing and various different outputs, including dispatch, and et cetera, et cetera.

Q. Okay. Are you aware that the PJM board has expressed concerns that PJM's load forecast overstates future load?

A. Is there a specific quote that you want me to look at?

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. FISK:

Q. Okay. Mr. Rose, you've been handed a

document that is labeled Exhibit 5; is that correct?

A. Yes.

Q. Okay. And it is identified on the first page as a PJM Planning Committee document called "Draft 2015 Load Forecast." Do you see that?

A. Yes.

Q. Okay. And it's dated December 4th, 2014; is that right?

A. Yes.

Q. Okay. Have you ever seen this document before?

A. I don't remember. I may have. I've certainly seen summaries of it.

Q. Okay. Okay. As far as you can tell, does this appear to be a PJM document?

A. As far as I can tell.

Q. Okay.

A. It certainly says PJM all over it.

Q. If you turn to Page 4 of the document, there's a sentence there, "The PJM Board and various PJM Stakeholders expressed concern regarding recent over-forecasting in light of established PJM findings of model shortcomings and plans to address them." Do you see that?

A. Yes, I do.

Q. Okay. Do you -- I guess going back to my earlier question: Do you have any awareness of these concerns about the over-forecasting?

A. Yes. They -- these concerns relate to not only the forecasts, and also I believe they're also related to the issues -- issues related to economic growth, but also the relationship between the demand forecast and the capacity market. So I think that these concerns are related to a number of different factors, and they manifest themselves in different PJM -- features of PJM.

Q. Okay. If you turn to Page 5 of the document, there's a discussion there about the PJM forecast team being tasked with identifying a short-term measure to address the over-forecast issue that can be implemented for the 2015 load forecast. Do you see that?

A. Yes. I -- I mean, I see that, yes.

Q. Okay. Do you have any awareness of the PJM forecast team working to address the over-forecast issue?

A. Yes, and related issues, some of which relate to the fact that for a given forecast they've

been excluding a portion of the demand. So they're not only going to be changing the forecast, but also eliminating that exclusion.

Q. Okay. If you look at Page 7 of this Exhibit 5, there's a discussion there about add a binary value in the recent history that captures the magnitude by which the model is overshooting recent loads. Do you see that?

A. I do see that.

Q. Okay. And then there's a statement that doing so contributes to a noticeable shift down in forecast load for many zones. Do you see that?

A. I -- I do see that.

Q. Okay. Are you aware that -- of this noticeable shift?

A. Well, what I'm aware of is that they are lowering their -- they've lowered their forecast and, like a lot of forecasting, they've been -- there's been some difficulty in 2013 and 2014, a lot of it related to slow economic growth until recently. But they're also increasing demand in the marketplace to offset -- that tends to offset the decrease in the demand forecast.

Q. And how are they increasing demand?

A. They've been excluding two-and-a-half percent of the -- of the demand in the capacity markets, and they've decided that that was inappropriate in their file to -- and I believe it's approved, but I have to double-check that, that they are going to include that to an add percent back in to the forecast that they used for the capacity market.

Q. And does your modeling account for that 2.5 percent exclusion and demand?

A. No. It takes into account the total demand; so it didn't have the 2.5 percent exclusion in it.

Q. So the fact that PJM may or may not be changing that 2.5 percent exclusion doesn't impact the results of your modeling, correct?

A. It mitigates the fact that there's a change in the forecast. So because our model did not have a 2.5 percent exclusion, to the extent that the demand decreased in their forecast, there would be no change in our forecast demand, at least with respect to capacity.

Q. I guess I'm confused. If your model did not include that 2.5 percent exclusion, then how does

the fact that PJM may be eliminating that exclusion change your results?

A. If they had not eliminated the exclusion, we would have had to decrease our demand forecast. The fact that they eliminated it meant that the forecast anticipated that elimination.

Q. Okay. So your -- right. So your forecast anticipated the elimination; so assumed it essentially, correct?

A. Right. Assumed the -- that PJM would eliminate the deduction that they had been implementing.

Q. Okay. Okay. So if that is assumed in the model, then the fact that they are actually eliminating it doesn't change your results at all, correct?

A. That's correct.

Q. Okay. The -- in the Exhibit 5, we're focused on -- separately from the 2.5 percent exclusion, we're focused on a change in PJM's demand forecast, correct?

A. Yes.

Q. Okay. And PJ- -- and -- and this change in demand forecast identified in Exhibit 5 is not

currently reflected in your model, correct?

A. That's correct.

Q. Just looking at Page 10 of Exhibit 5, there's a chart identifying the summer peak forecast for the PJM RTO as a whole; is that correct?

A. Yes.

Q. Okay. And the blue line starting at 2014 is the 2014 forecast; is that right? It's a little hard to see, sorry.

A. Yeah. I really can't verify that, but it seems like that probably is what it is.

Q. Okay. Well, you see at the bottom it says "Actual," it has a black line.

A. I do see that.

Q. Okay. And there's the black line on the chart.

A. Yes.

Q. Okay. Then there's a "Weather Normalized," which is the red line.

A. Yes.

Q. Okay. And then there's a blue line that says "2014 Forecast," and a blue line on the chart.

A. Right. I'm assuming that --

Q. Okay.

MR. ALEXANDER: Only answer if you have knowledge regarding this.

THE WITNESS: Right, right. I mean, it's just hard to see the key, that's all I'm saying.

BY MR. FISK:

Q. Okay.

A. But it seems logical.

Q. Okay. And then there's a green line. Do you see that it says "2015 Preliminary Forecast"?

A. Yes. It's sort of a draft.

Q. Okay.

A. It's also marked "Draft" in the document.

Q. Okay. But it is a lower line, correct?

A. Yes. And as I indicated that there's no offsetting effect for PJM, which is they're increasing the demand in the capacity market.

Q. But we already discussed that offsetting factor was already included in your model; so it doesn't change your model?

A. That's correct.

Q. Okay. Do you know how the -- do you know how if you used the lower load forecast included in the draft 2015 document, Exhibit 5, if you

included that as an input in your model, do you know how it would affect your energy and capacity price projections?

A. As we discussed, I would have to run it through the model to determine what the effect would be because of the offsetting factors.

Q. Okay. And you have not done that, right?

A. I have not done that.

MR. FISK: Okay. Can we go off for a second?

(Discussion held off the record.)

(Recess taken.)

BY MR. FISK:

Q. Just to circle back briefly to something we discussed earlier, we were talking about, you know, once you've done your inputs, you developed your projections, sometimes your clients will then run it, take their own modeling program to do, you know, dispatch modeling of their plants; is that correct?

A. Yes.

Q. Okay. And do you know of any clients who have done that dispatch modeling on a monthly

basis rather than an hourly basis?

A. In my experience, the asset owners are doing monthly calculations, among other calculations, in part because the commercial transactions are monthly. And as I indicated, some of our inputs are monthly, and it's now, with my memory, a little bit better than it was earlier.

We did provide monthly averages to -- in addition to the hourlies in addition to the annual averages, but in general many commercial activities are monthly. So you have, like, a hedge, it's a monthly hedge, short-term hedge. So it's necessary and common to do a monthly model.

Q. For something when you're trying to project the revenue of a plant over a 15-year or 20-year period, you're saying it's common to do a monthly dispatching?

A. It's common to have monthly results, I think is what I meant to say.

Now, these asset models are typically -- are most frequently used for shorter-term analysis because there are shorter-term planning, budgeting and commercial activities that are -- that require monthly information. But then when they're used for

longer term, they may continue to be monthly or they may report their results in a more aggregated way, particularly out over time.

Q. Okay. So when you say that monthly, you're talking about how they report their results, right?

A. Yes. And they -- you know, some of their inputs may be monthly, and some of their analysis, you know, may be monthly, but in my experience dispatching is not done just by monthly, it's done by monthly hour types at a minimum.

Q. Okay. Do you know of any clients who in doing a longer-term projection, say 15 years with regards to a generating unit, who have done hourly dispatching?

A. There are some clients that do hourly dispatching, some are doing hour-type dispatching in my experience.

Q. Okay. And do you know and are you -- are you aware of any clients who with a 15-year projection did only monthly dispatching as the -- not just what they're reporting, but the actual dispatching analysis they did, they did it only monthly?

A. First of all, my earlier response wasn't limited to just 15, that's pretty idiosyncratic, you know, I'm thinking long-term.

Q. Okay.

A. Now, in terms of the dispatching, I just want to make sure that we're communicating, I'm not sure. Are you asking me are they -- what does it mean in your -- when you're asking me this question, monthly dispatching?

Q. Well, I guess I am used to for other proceedings seeing modeling where someone who is dispatching their unit will use something like Strategist in which on an hour-by-hour basis they will compare -- you know, the model will compare their variable operating costs to the hourly energy price, projected energy price --

A. Right.

Q. -- to determine how much the plant's going to dispatch and how much revenue's going to be generated.

A. Yes, that is common. But, again, the asset owners themselves have their own internal tools for budgeting purposes, for commercial activities, for planning. And to my knowledge, no one's

dispatching based simply on an average monthly price, they're disaggregating it. In some cases, they disaggregate more or less depending on the circumstance.

Q. Okay. As in your understanding, FirstEnergy here disaggregated the energy price?

A. Yes, to the extent I understand. I didn't focus in on what they were doing; I focused more in on what our part of the process was.

Q. Okay. And just so I'm clear, on a long-term projection it's your testimony that you do have clients who have done the dispatching based just on such a -- on some sort of hourly disaggregation versus an actual hourly dispatch?

A. Yes, yes. In part because they're typically using the models that are more geared towards the asset owners, as I indicated, budgeting, planning, and commercial decision making.

Q. Okay. Would you agree that hourly dispatching is more -- a more sophisticated analysis than something that is just based on hourly disaggregation?

A. Yes. I think that the more detail you have, the more sophisticated it is; however, you

know, a critical issue in modeling is finding the right balance between the detail and sort of the scope of your analysis. If you focus in more on detail, you end up in a situation, A, where you have to eliminate the consideration of certain feedback loops and relationships and, furthermore, you end up having much longer periods of time which can make it not feasible effectively to provide the service that the model is trying to do.

So there are significant tradeoffs and more is not always better, because there is a limited amount of time and resources and issues that can be addressed. If you overly focus in on one to the exclusions of the others, it could be a serious problem.

Q. Don't utilities do hourly dispatch modeling?

A. I'm sorry?

Q. Don't utilities commonly do hourly dispatch modeling?

A. Yes. They frequently do, but they also do hour-type modeling as well, and the same thing for ICF.

Q. Okay. But there's no significant hurdle

to doing hourly dispatch modeling, correct?

MR. ALEXANDER: Objection. In what context?

THE WITNESS: We discussed this earlier. There are issues related to the time it takes and the complexity and the things that you lose when you focus more in on hourly versus other periods of time, and it depends on the context that you're doing your work on.

BY MR. FISK:

Q. And in terms of dispatch modeling, when you're evaluating, you know, the revenues and operations of a plant, does IPM evaluate that plant in comparison to the other plants in its region or in its RTO?

A. Yes, and to a lesser degree for the whole country --

Q. Okay.

A. -- or North America actually.

Q. Okay.

A. But it's -- it is addressing the competition there, yes, very much so.

Q. Okay. Do you agree that that is a more sophisticated analysis than a dispatch analysis that

does not look at competition between plants?

A. Yes, it's more sophisticated. But having said that, the critical parameter, which is effecting and determining the competition, is the prices. So the expected prices are the most critical parameter, and that is a, you know, miracle of economics that so much information can be conveyed through prices, and that's why capitalism works. I mean, you know, pricing is critical.

Q. Okay. But there is a -- I would assume, given that IPM looks at competition between plants, there is a value to your analysis of looking at competition between plants rather than just dispatching a single plant against a market price, correct?

A. Yes. One of the principal advantages is that you can actually determine the market prices, and that's why some of the other modeling is having to externally determine what the prices are and then input those prices into the model.

So we're doing everything together, but when we do -- that is, the prices and the dispatch, capacity expansion and various different other decisions, when we do that, that means there's a

certain amount of simplification that we have to employ in order to capture the --

Q. But even once you've identified a projected price as an input, it's still a benefit to assessing how an individual plant competes with the rest of the plants it would be competing with rather than just looking at one plant against the market price, correct?

A. It might be, it depends. I mean, obviously you get more information by having, you know, more insight into what's determining the market conditions. But as we discussed earlier, these modeling -- the modeling that's taking the prices as opposed to determining the prices typically has greater detail with respect to the individual power plant, its costs, performance characteristics, which are captured in a more, if you will, averaged or with that much detail in these larger models.

So there are tradeoffs, and it's not uncommon, in fact, it's very common, for us to be poring over our results into more specific asset-related models, it's extremely common.

Q. Okay. And do you know of any utilities or, say, any of your clients who have done long-term

revenue projection for a plant based on an Excel spreadsheet model?

A. Yes.

Q. And how many?

A. Again, I think Excel spreadsheeting is extremely common in the industry. As -- as I indicated, all of our engagements, whether it's for testimony or not, are very likely to have Excel spreadsheet components to them. It's just that we are providing a specific service to -- that's related to these very large sophisticated models.

So, for example, the reason why we're doing the work for EPA and also for the affected companies is because that modeling is extremely sophisticated and very expensive and difficult to do. And so it's common for people then to take those results and use that in more detailed spreadsheets that are asset specific or company specific.

Q. Okay. But I guess my question was, and just -- you know, is there some component that will be done on Excel, but the actual dispatch modeling for a long-term revenue evaluation of a generating asset, you know of clients who have done that simply based on an Excel spreadsheet?

A. Yes. In some cases, clients are using Excel spreadsheets to mark every day their asset positions, and that involves a long-term analysis, and it's focused in on the value of their assets or a description of their position in the marketplace. So it's, you know, common.

Most analysis, most activities are -- tend to be more short term, but it's not uncommon for people to take the analysis tools and use them for both.

Could I just take one break and just drink a little coffee here for a second?

Q. Certainly.

A. Okay.

(Pause.)

Q. Okay. Turning to a new topic with regards to capacity price projections, and we're not going to talk about any numbers at this point, you identify on Page 6 of your testimony, starting at Line 15, various reasons why you believe that capacity prices will increase; is that correct?

A. I'm on Page 6, Line 15.

Q. Yes.

A. And it is discussing reasons for

increases in capacity prices.

Q. Okay. Great. And if you actually start at Line 19, Page 6, and going over to Line 2 on Page 7, one of the factors that you identify is your belief that there will be less capacity price depression from DR; is that correct?

A. Yes.

Q. Okay. And DR is demand response; is that right?

A. Yes. In the situation that we're talking about, PJM, it's primarily interruptible load.

Q. Okay. And how do you define interruptible load?

A. It's a defined product in PJM, and it refers to resources that are only required to interrupt 60 hours -- up to 60 hours a summer, and can be only interrupted, I believe, something on the order of 10 times during the summer.

Q. Okay. So your testimony regarding capacity price depression from DR, are you referring to any other types of demand response besides that 60-hour per summer interruptible load?

A. Yes. Although I'm primarily focusing in

on the interruptible load, because I believe it accounts for 90 percent of the demand resources that participate in the capacity markets.

Q. Okay. And so am I correct, your basic point is that this demand response has been holding capacity prices down and, therefore, keeping newer capacity from coming into the market; is that right?

A. It is primarily my -- I'm referring to the fact that, as it says, prices have been lowered, and it's been lowered by a combination of the DR and the rules related to DR which have, in some cases, in the view of PJM inadvertently depressed prices, but overall it's a combination of the DR participation and the rules and regulations related to DR.

Q. Okay. Okay. And when you say it's depressing capacity prices, that means keeping them well below the cost to new entry or --

A. Depressing them below what they would otherwise have been were it not for the DR and the associated rules. Later on in the testimony, I have specific quantitative calculations that have been made by the entities that have access to this information. And so it's a combination of the qualitative impact, as well as the quantitative

impact.

Q. Okay. And you testify on Line 20, on Page 6, that this -- this capacity price depression from DR is, quote, "unsustainable." Do you see that?

A. I do see that, yes.

Q. And that is your opinion; is that correct?

A. Well, it's my opinion, but it's also a fact, because the depression has led to filings which have said we have inadvertently set up rules and implemented the market that -- in a mistaken way and it allows the DR to lower the price. FERC has adopted that particular filing and the corrections to that. So I'm referring both to things that have already occurred, as well as to things that are proposed and I believe likely to occur at some point in the future.

Q. Okay. So would you say that the -- the system is in the process of fixing itself in terms of DR and capacity price depression?

A. Yes. And as we discussed the process, some of the things have been done already and are part -- well, the law and the rules and regulations, I'm not offering a legal opinion.

Q. Sure.

A. I'm just describing changes in the rules, some of it is things that are ongoing, for example, related to the December 12th and December 24th filings of PJM --

Q. Okay.

A. -- of 2014.

Q. Okay.

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. FISK:

Q. You've been handed an exhibit marked No. 6; is that correct?

A. Yes.

Q. Okay. And this is the companies' response to Sierra Club Set 1 - Interrogatory 24; is that correct?

A. Yes.

Q. Okay. And you are identified as the witness on this response; is that right?

A. Yes.

Q. Okay. And have you seen this document before?

A. Yes.

Q. Okay. And the request here asks you to

explain the basis for your contention that the depression of capacity prices from DR is, quote, "unsustainable"; is that right?

A. Yes.

Q. Okay. And in the response after the objections, in the fourth line you say, "The depression of capacity prices below costs from DR ultimately results in capacity shortages, especially in the winter." Do you see that?

A. Yes.

Q. And, "Capacity shortages and black-outs are not sustainable due to the very high value of power to consumers." Do you see that?

A. Yes.

Q. Those are your opinions; is that correct?

A. Yes. Those are the underlying reasons why there are changes in the marketplace that are afoot.

Q. Can you identify any time the demand response has caused blackouts?

A. No. But it's a contributor to the problems that occurred during the polar vortex when the system was stressed, and it is also the reason --

a reason -- an important reason why PJM has concluded on August 20th for the first time, of 2014, that in the event of the repeat of the polar vortex it will shed load -- it is likely to shed load during the winter, which is very -- a very dangerous situation.

Q. And with regards to the polar vortex, did PJM also find that demand response played a very important role in ensuring that blackouts did not occur?

A. What it concluded, that approximately 20 percent of the DR voluntarily decided to participate, but it is also the case that it has concluded that the market fundamentally needs to be restructured to provide greater reliability of capacity and including greater reliability from DR.

So, you know, it's -- there was some mitigating aspects to the general problem, which is that the DR resource, which is an increasingly large resource, is, unlike the other resources, only required to be available up to 60 hours during the summer.

Q. So is your testimony here a concern about DR itself, or more concerns about how DR is currently structured under the PJM constructs?

A. My concerns are primarily the latter, that the DR, as structured in the current context, is causing the prices to be below costs and leading to dangers to public health and safety.

Q. Okay. And you refer to, in your Exhibit 6 discovery response, capacity shortages being caused by DR, correct?

A. Yes. In part by DR.

Q. Okay. Can you identify any time that the response has caused an actual capacity shortage?

A. Well, during the polar vortex, the system was short of capacity; however, it didn't result in blackouts, but it resulted in voltage reductions and other emergency conditions. So -- and that event, combined with projections that without a change there will be load shedding, is the reason why the market has already been restructured partly and is in the process of additional restructuring.

Q. Okay. Wasn't a major cause of the capacity concerns during the polar vortex the fact that many units in PJM were unable to operate due to the cold temperatures?

A. Yes. There were a number of different causes for the problems in the polar vortex. In my

opinion and in the -- an important factor was that a large portion of the resources that are the reserves are not obligated and did not participate in providing energy or capacity during the winter. They're only obligated to participate up to 60 hours during the summer. That is an option that's not available to the supply resources, it's only available to the DR resources, and it's a very serious problem.

Q. Okay. Would you agree that the unavailability of capacity in PJM due to mechanical issues at many of the plants is also a very serious problem?

A. Yes. And it's a direct result of low capacity prices, which are in large part related to the suppression of capacity prices through the DR and other issues as well.

Q. Okay. And are you aware that PJM has submitted a proposal to FERC to create a capacity performance product?

A. Yes. I alluded to that earlier, the December 12th filing of PJM to FERC, December 12th, 2014.

Q. And my understanding is that that filing

is intended to provide basically incentives to ensure that generating resources will be available when needed during summer or winter peak periods; is that correct?

A. Yes. But it's more correct to say that it's resources in general, including DR resources. There's a separate filing made December 24th for the foreseeable situation in which DR is illegal in the context of receiving payments through any FERC-regulated entity.

Q. Okay. And for the capacity performance proposal, have you evaluated whether the Sammis plant would be able to comply with and qualify as a capacity performance resource?

A. I have not examined the specifics of the Sammis plant. In general the things that would allow you to qualify would be firm access to fuel on the part of a generating facility, and because coal power plants have coal piles they are -- would qualify as capacity resources under the capacity performance proposal of PJM.

Q. There's other qualifications, correct, under the capacity performance proposal?

A. There are other qualifications, but I

believe the most critical one to determining the capacity price is the cost of firm fuel --

Q. Okay. Do you know what --

A. -- as opposed to nonfirm fuel.

Q. Do you know what any of those other qualifications are?

A. Some of the qualifications include willingness or agreeing to participate in the -- in the energy market in the -- bidding in the day-ahead market. It's the indication that you -- on the part, I believe, of the company, that you -- officers that you are intending to be a firm capacity resource, and you have to agree to be willing to subject yourself to the penalties for nonperformance. So it's a set of voluntary things that you have to agree to voluntarily.

Q. Is the ability to reliably operate also one of the qualifications for capacity performance?

A. Yes. There are tests as well as penalties that -- to obtain under the capacity performance proposal.

Q. Okay. If a plant is not able to meet that, you said there's a possibility that they would be subject to penalties; is that right?

A. Yes. That the penalties would occur during peak hours defined by the tariff.

Q. Okay. And you haven't evaluated whether the Sammis plant could meet those ability-to-operate reliability -- reliably qualifications?

A. I have not examined the specifics of Sammis. I just have the general comment I made earlier, which is generally coal power plants can supply because they've met the most difficult criteria for a generator, which is having firm fuel.

Q. Okay. And how have you evaluated whether Davis-Besse would satisfy the ability-to-reliably-operate qualification for the capacity performance?

A. I have not evaluated the Davis-Besse, but whereas the typical coal pile is 30 to 60 days, typically closer to 60, typical fuel on site at a nuclear unit is between three and five years; and, therefore, all the more so, the nuclear units would meet that particular criterion.

Q. Okay. But obviously if they have significant outages, they might have problems meeting the ability-to-reliably-operate criterion, correct?

A. It's possible, or they would be subject

to the penalties that occur under the proposal.

Q. Okay. And same with regards to the OVEC plants, have you evaluated whether they would qualify for the capacity performance standards?

A. I have the same response, which is I have some knowledge of those plants based on their generic fuel status, but I haven't examined the individual plants.

Q. Okay.

MR. FISK: Can we go off for a second?

(Discussion held off the record.)

MR. FISK: Okay. I believe everything else is confidential. I'll reserve the rest of my time for the afternoon.

MR. ALEXANDER: Becky, would you like to go next?

MS. HUSSEY: Sure.

- - -

CROSS-EXAMINATION

BY MS. HUSSEY:

Q. Would you turn to Page 38 of your testimony, please?

A. Yes, ma'am.

Q. Okay. And there you're talking about in

part auction results from the BRA would be used through May 31st, 2018, I'm assuming; is that correct?

A. Correct.

Q. Okay. And then in the intermittent period of time from 2018 to 2020, you referred to projected PJM capacity prices to reflect transition from auction pricing.

A. Yes.

Q. And I wondered how you developed the prices or the price forecasts for 2018 to 2020.

A. There's linear interpolation. So, for example, in 2018 the first five months are the BRA prices, and the second seven months are the linear interpolation between the 2018 and 2020 numbers. The 2018 being the 2017, 2018 BRA results from the capacity market, and the 2020 are the projections from the IPM model.

Q. Okay. And so neither the MAPS model or the IPM model was used for the 2018 to '20 years?

A. It was used indirectly in the sense that it was a linear interpolation between a number and another number, one of which was an IPM output.

Q. Okay. And I believe you've talked with

Mr. Fisk about after 2020 or before 2020 and beyond that the IPM model would be used. If you could turn to Page 39, Line 4, you discuss how the IPM model can retire, mothball, and build power plants to meet reserve margin targets. And I wondered if in your modeling you explored the possibility of retiring or mothballing Sammis at all.

A. First of all, in one of the predicates to your question, I wanted to clarify that we're using the IPM to forecast capacity prices from 2020 on and to contribute a linear interpolation that we just discussed.

With respect to the modeling, I would have to double-check. I believe that the modeling did not give the plant the opportunity to mothball or retire. I don't -- that is, I believe, because the projection in the first 10 years is from the GE-MAPS model and supplemented by the IPM model, and let me -- let me amend what I said.

In the IPM model, I believe that we tested to see whether Sammis would retire. I believe I concluded that it would not, and then we put that result that it did not retire or mothball into the GE-MAPS model, and then it ran, but I would have to

double-check to make absolutely sure.

Q. Okay. Thank you.

On Page 45 at Lines 11 and 12, you state that IPM is a dynamic model that optimizes capacity decisions over the entire planning period simultaneously. And I wondered if you could explain to me what you mean by "optimizes capacity decisions."

A. Yes. The optimization is the least cost or profit-maximizing outcome that takes into account the minimizing-cash-going-forward costs on a discounted basis. So in every time period, the model asks the question of what should be done with each individual power plant, including whether it should be retired, mothballed, whether it should be retrofit, et cetera; so making the decision based on minimizing discounted cash flows.

Q. Okay. Can you explain the "simultaneously" portion of your statement?

A. Yes. The -- in the modeling that we're doing, both the GE-MAPS, but in particular here we're discussing IPM, we're using linear programming, that's a technique that involves the simultaneous determination of a large number of variables. And so

we're simultaneously determining the action of all power plants, all transmission flows, all investment decisions as opposed to doing that sequentially or offline, if you will. So that's what we mean by simultaneously.

And the optimization is a -- an achievement of the mathematical breakthroughs that led to linear programming.

Q. Okay. Thank you. And I'll ask you to explain one more statement. If you could turn to Page 45, Line 14, you discuss -- you say that, "GE-MAPS does not incorporate investment decision-making endogenously because of its very detailed treatment of transmission and nodal pricing." Can you explain exactly what you mean by "investment decision-making" there?

A. Yes. So the decision making is related to the -- and anything that involves intertemporal decision making, but in particular whether or not you should mothball, retire, build a new power plant, which plants you should do that for, or what retrofit adjustment might you want to make to the power plant.

It is not something that can be analyzed in GE-MAPS as I discussed earlier in my deposition.

It's part of the tradeoffs that are involved in various different modeling exercises.

Q. Okay. And is there any -- I understand the retrofitting, mothballing, retirement-type decisions. Is there anything else that you would include in investment decision making, that category that you've described there?

THE WITNESS: Could you read back the question, please?

(Record read back as requested.)

THE WITNESS: You know what, the question's a little bit, you know, type issue. It's -- those are the main decisions that are involved in this particular category of decisions we're talking about.

BY MS. HUSSEY:

Q. Okay. And getting back to the GE-MAPS model. Because the GE-MAPS model doesn't necessarily incorporate this type of decision making, would you consider that a flaw in the model?

A. No. I would consider it a feature or aspect of the model. Of course, that's related to the reason why we supplemented the analysis whenever we used GE-MAPS with the IPM results, and it's

necessary to conduct the sophisticated analysis that was requested of us by the client.

Q. Okay. And was your decision to use GE-MAPS for the initial period of time and then the IPM for the more secondary period of time or the long term, was that decision prompted by the complexity of what they -- what the companies asked you to do?

A. Yes. As I indicated earlier, the company requested nodal analysis.

Q. Uh-huh.

A. And so that was an important factor in designing the engagement which was, as I indicated, very sophisticated and complicated.

Q. Okay. And IPM does not take nodal analysis into consideration?

A. No. It is a zonal model; so it collapses individual nodes into what's known as a centroid, and it's a zonal model. That adjustment is a critical part in the ability of the model to address the intertemporal issues that we were just discussing.

Q. Okay. On Page 46 you're discussing the IPM model, and you indicate that, "Energy efficiency and demand side management programs are evaluated in

an integrated framework with other resource options"; is that correct?

A. Yes. That's what it says.

Q. Okay. And then what other resource options would be considered?

A. The IPM modeling is considering various different types of power plants at different locations and different time periods, and it's optimizing or minimizing the cost of various different resource options. And it depends on how the model's being used, but, for example, it's common for it to consider whether it wants to build renewable power plant or a gas-fired power plant; and if it's a gas-fired power plant, which type of gas-fired power plant, when and where, et cetera. Those are what I'm referring to in terms of resource options.

Q. Okay. So fuel resource options?

A. Yes. The choice of fuel is made frequently within the model, and many power plants have multiple fuel options, some power plants don't, but some do.

Q. And does the model in any way favor a certain type of resource over others?

MR. ALEXANDER: Objection; vague. Go ahead if you can.

THE WITNESS: No. I think that the model is, you know, a fair statement of the integrated resource planning problem, which by -- the essence of that is trying to give a fair balance treatment to different resources. The degree to which we're dealing with each individual resource varies depending on the application of the model, but I wouldn't say that it's biased, just the opposite.

BY MS. HUSSEY:

Q. Okay. On Page 47 you discuss ICF's gas market model forecast. And I believe you indicate that the trend of low supply area and natural gas prices will continue in the near term. I just wanted to confirm that when you said "near term" there, you were talking about the one to five-year period that you discussed with Mr. Fisk earlier?

A. Yes, approximately.

Q. Okay. And on Page 49, you talk about how the NYMEX futures price does not reflect specific supply and demand assumptions. Can you tell me what assumptions you're referring to?

A. Yes. We're referring -- what I'm

referring to here is, for example, on the demand side how much demand is at a specific location. For example, in North America, when does it occur, that particular demand, what sector is it from. It's not describing what pipeline flows or storage injection or withdrawals are involved. It's not assessing -- there's no way to determine what gas is being produced that's underlying that particular projection.

So it's a price, and a liquid price. It's not the result of a modeling framework that could then answer the question of what are the supply and demand conditions that are causing that price.

Q. Thank you. Page 55, Line 10, you talk about how ICF assumes that the federal CO2 program will be a cap and trade program. And I wondered in your estimation what other forms the program could take.

A. There is a possibility of a program that is of the form in which there are complementary measures being used to pursue CO2 control. We think that that's a possibility. Complementary measures refers to things that wouldn't result necessarily in a dollar-per-ton number that would be used for its

certain decision making and/or for trading and commercial activity, such as energy efficiency programs or renewable incentives. That's sort of what we're referring to in terms of complementary measures. But --

Q. Okay.

A. -- as we discussed, we have a specific dollar-per-ton number, and we think that that's a probability to weigh the likely outcome.

Q. Okay. And my understanding you assessed several utility sector CO2 control programs, or proposed programs, using the IPM model. And could you provide any detail about what these programs were?

A. We examined a program that assumed a cap on utility sector emissions of approximately 1,500 pounds per CO2 per megawatt hour starting in 2020 with the limit lowering to 1,000 pounds CO2 per megawatt hour by 2030, with that limit applied to utility power plants generally, not just to existing or new plants.

We also examined a Wasman Markey type of legislative proposal, but as it applied only to the power sector. We also considered a case in which

there are complementary measures which had no dollar-per-ton price, and we took a probability-weighted assessment, as we do for all our variabilities, but in that case it was a particularly explicit assessment to calculate the dollar-per-ton numbers that we have in our projection.

Q. Okay. And you detailed that ICF gave probabilities to two of the case that you just described to me. Which cases are you specifically talking about when you make that reference?

A. I'm referring to the assignment of probabilities to all three cases. One of the cases is a case in which there is no price, as I indicated, because it's assumed that there will be complementary measures of some form. And, again, I indicated as a general matter all of our inputs are probability weighted; therefore, it's expected probability-weighted value.

In this particular case, we did an explicit probability weighting of all three CO2 price vectors or streams, and then calculated an expected CO2 price in dollars per ton. So a probability times zero is a contributing factor to that calculation; so it's all three cases.

Q. Okay. Thank you. That's all I have on the public record.

MR. ALEXANDER: Okay. Mr. Oliker, would you like to go next?

MR. OLIKER: Sure.

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CROSS-EXAMINATION

BY MR. OLIKER:

Q. Good morning, Mr. Rose. My name is Joe Oliker, and I represent IGS Energy.

A. Good morning.

Q. I have a few questions for you today. I'm going to try to tread lightly because of the confidential nature, and I don't want to get too close to that line. So if I do tread into confidential waters, please let me and know I'll try to hold that off until later.

A. Okay.

Q. And first, are you hearing me okay?

A. Yes, sir.

Q. Okay. Great.

I heard a little bit of discussion about this earlier, and maybe it was because I'm on the phone, but were any assumptions provided to you by

FirstEnergy or FirstEnergy Solutions?

A. No.

Q. Okay. And earlier -- sorry to jump around, but earlier, looking at what was marked -- I think it was your Exhibit 5, that was a PJM load forecast of demand and also net energy, correct?

A. Yes. But it's a draft forecast, and it's something that occurred after we finished our analysis.

Q. Okay. And that's -- let's talk about -- do you have your workpapers with you?

A. Yes.

Q. And I have a question about that, and feel free to tell me if this is confidential. But turning to the forecast of peak demand in your workpapers, is this truly a confidential document or is this -- are these PJM numbers?

MR. ALEXANDER: Mr. Oliker, could you give a reference to which workpaper you're referring to so we can find it?

MR. OLIKER: I believe it's the first page of Rose workpapers confidential version, and it may be because of '29 to 2035, but I just want to know if these are -- if this is actually confidential

information or if I should ask this here on this record. Just feel free to let me know when you get there. I don't want to rush you.

MR. ALEXANDER: Sure. We're trying to find the workpaper right now. We'll let you know when we've got it.

MR. OLIKER: Sure. The document I'm talking about says "Gross Peak Demand" and underneath there is a table, "Net Energy."

MR. ALEXANDER: Mr. Oliker, that was produced in both the confidential and public versions of Mr. Rose's workpaper. So I think if you're referring to the public version, then you're fine to go forward right now.

MR. OLIKER: Okay. I'll try to be careful. I don't believe I have the public version in front of me, but let's -- Mr. Rose, would you agree that the 2014 through 2029 portions of this document are not confidential and they're taken from PJM's publicly posted tables?

THE WITNESS: Yes.

BY MR. OLIKER:

Q. Okay.

A. Excuse me, one or two-minute break.

MR. ALEXANDER: Sure. We need a brief break before you ask your next question.

MR. OLIKER: Sure. How much time do you need?

THE WITNESS: Just a minute.

MR. ALEXANDER: Let's say five minutes. We'll come back at five till.

(Recess taken.)

BY MR. OLIKER:

Q. We talked about Sierra Club Exhibit 5, and then now we're looking at your workpapers. First just -- and I'm sorry if I repeat anything, but can you just tell me exactly what the peak demand and energy assumptions were used for in your forecast? Am I correct it was used for the capacity forecast?

A. The energy and peak inputs are used to determine the -- are inputs to all of the forecasts that relate to, for example, PJM electrical energy prices, PJM capacity prices, PJM power plant, dispatch, et cetera.

Q. Okay. So just so I can be clear, because there's two tables that we're talking about here, one is the gross peak demand and one is energy, were both tables used for each of the projections

that you talked about?

A. Yes. But the -- the gigawatt-hour projection is more relevant to the energy price forecast, and the megawatts are more relevant to the capacity price forecast, but they are both relevant to each of the forecasts.

Q. Okay. Thank you.

And just to be clear, the first table of Gross Peak Demand comes from Table B-10 from February 2014, and the second table comes from Table E-1 from February 2014, and for PJM, correct, and that's listed underneath both tables as a source?

A. Yes.

Q. And do you regularly look at PJM's load forecasts?

A. Yes. I would say, you know, fairly regularly.

Q. When was the last PJM load forecast you looked at?

A. Excluding today, I did review a summary of the -- of the more recent draft forecast.

MR. OLIKER: Trevor, could you please provide the document that I sent over yesterday containing the PJM 2015 load forecast so I can mark

it as an exhibit?

MR. ALEXANDER: Sure. Give me just a second.

MR. OLIKER: Sure.

(EXHIBIT MARKED FOR IDENTIFICATION.)

MR. OLIKER: I'll ask the court reporter and Trevor in the meantime, do you want me to mark this as an IGS exhibit or keep going forward in the exhibit numbers?

MR. ALEXANDER: Keep going forward in the exhibit numbers.

MR. OLIKER: What number are we on?

MR. ALEXANDER: 7.

MR. OLIKER: 7, okay.

MR. ALEXANDER: Was there a question pending?

MR. OLIKER: No. I'm just waiting.

MR. ALEXANDER: We're ready. Go ahead.

BY MR. OLIKER:

Q. Okay. Mr. Rose, do you see the documents I've placed in front of you as the January 2015 PJM Load Forecast Report?

A. Yes. I see that label on it.

Q. For the record, I'd like to mark this

document as Deposition Exhibit 7.

Have you seen this document before?

A. No.

Q. Does it appear to be prepared by the PJM Resource Adequacy Planning Department?

A. It so indicates on the first page of this document.

Q. Okay. Take a minute to look at this document, and let me know if you have any reason to believe if this is not a true and accurate copy of a PJM document.

MR. ALEXANDER: Objection. He's testified he's never seen it before; so he can't opine on that.

MR. OLIKER: He can say that.

MR. ALEXANDER: You can answer if you've seen the document before, if you believe this to be a true and accurate copy of the document that you've seen before. If you have not, then so state.

THE WITNESS: As I indicated earlier, I have not ever seen this document before.

BY MR. OLIKER:

Q. So it's my understanding you've seen Sierra Exhibit 5, but you have not seen this

document?

A. I believe I've seen the December 4th document, and I have seen summaries of recent load forecasting by PJM, but I have not seen the document that I was handed just now.

Q. Okay. And that being the case, can you look at the executive summary on Page 1 and 2, particularly on Page 2. Look down to the fourth bullet. Do those conclusions regarding summer peak forecasts appear to be similar to what is contained in Sierra Club Exhibit 5?

A. The -- the document Draft 2015 Load Forecast, which I looked at earlier, has in 2018 a negative 2.6 percent change relative to the previous forecast, and that is similar to the fourth dot point in the document I just received, the 2015 forecast for the summer peak demand, but I can't -- I don't see here the 2015 or 2020; so I can't comment fully.

All my comments are subject to the caveat that all I'm looking at is Page 2, the dot point there, and I haven't reviewed the document previously.

Q. Okay. And could you turn to Page 70 in that document, which is labeled Table B-10. Tell me

when you're there.

A. I'm there.

Q. First, would you agree that Table B-10 is the same table name that was used in your workpapers for gross peak demand?

A. Yes.

Q. And would you agree, looking at Page 70, 71, under PJM RTO, the total values for every year are approximately 5,000 megawatts smaller?

MR. ALEXANDER: Objection.

MR. OLIKER: Give or take.

MR. ALEXANDER: Objection. That's a lot of math, and there's approximately 20 lines over 15 years here that he can't really do that in his head.

BY MR. OLIKER:

Q. Okay. Let's start with the first year, how about 2015, would you agree that Page 70 shows a megawatt peak demand for the PJM RTO of 155,543, and you've included in your workpaper for 2015 a value of 160,259?

A. Yes.

Q. And then in 2016 you've included in your workpaper a value of 162,468, whereas Exhibit 7 contains a value of 157,909?

A. Yes.

Q. And this trend of -- would you agree that Exhibit 7 contains lower values throughout the entire forecast period than you have included in your workpaper?

MR. ALEXANDER: Again, objection. He hasn't seen Exhibit 7 before. We'll stipulate the document says what it says, if that helps.

MR. OLIKER: He can answer.

THE WITNESS: The numbers in the few examples I've looked at appear lower, not always 5,000 megawatts lower. There seems to be some compression, but I've just spot checked a few of them.

BY MR. OLIKER:

Q. Okay. And could you -- would you agree that the ATSI zone is also lower in each year in Exhibit 7 than it is in your workpaper?

A. I'm looking at 2015, and it looks like it's around 200 megawatts lower. That's the only one I've been able to check.

Q. Okay. So in 2016 you've included in your workpaper 13,013, and then if we look at Exhibit 7, would you agree for 2016 it says 12,828?

A. Yes.

Q. And you would agree that the demand, according to Exhibit 7, does not reach 13,000 until 2020?

A. Just reading the numbers off here, it does appear to be the case. Again, I haven't reviewed the document, and I don't know whether there's any mitigating factors or anything with that.

Q. Okay. Whereas in your workpaper, demand is at 13,000 starting in 2016 and staying at that level to 2020, correct?

A. In 2020 it reaches 13,253.

Q. And in 2016 it is already at 13,000, correct?

A. 13,013 in 2016.

Q. Okay. Now, can you turn to Page 86 and 87 in Exhibit 7, please? Let me know when you're there.

A. I'm at Pages 86 and 87.

Q. And would you agree that is Table E-1?

A. Yes. That's what it says.

Q. Would you agree that it's the same table name that is allegedly the source of the net energy values in your workpaper?

A. It has the same table, E-1, but sitting here I don't know if they're -- it changed the table formatting or anything like that.

Q. Okay. And if you were to compare the line that says PJM RTO, would you agree in 2017 this table says 828,506?

MR. ALEXANDER: Once again, same objection. The document's 100 pages, the witness hasn't appeared to have seen it, and there's a lack of foundation, but go ahead and answer if you can.

THE WITNESS: Could you repeat the question?

BY MR. OLIKER:

Q. So if you look at 2016 under PJM RTO, the bottom line.

A. Yes.

Q. Would you agree that the value is 828,506?

A. Yes. That's what it says.

Q. And if we look at net energy on your table in 2016, it says 863,762.

A. It says that, but I haven't had a chance to look at why there might be that difference.

Q. Would you agree if you look through 2016

through 2020, compare table -- or, your workpaper to Exhibit 7, Exhibit 7 contains lower values in each year?

MR. ALEXANDER: Same objection.

THE WITNESS: I looked at the years 2016 to 2020, and the numbers are lower in the table in the exhibit that was handed to me versus in the table that's here, but I don't -- haven't -- I don't know anything about the new document that you gave me. I haven't looked at it before; so I don't know what's deriving the differences.

BY MR. OLIKER:

Q. But you would agree for purposes of your testimony you have relied on PJM's projections?

A. Yes. The 2014 projections as described in the footnote.

Q. Okay. Sorry to jump around here, but you talked a little bit about forecasting the price of -- or the proposed impact of carbon regulations. Do you remember that discussion?

A. Not specifically. Is there a specific reference?

Q. Sure. From a high level, you would agree that there are proposed carbon regulations that

are going to go into effect in the year 2020, correct?

A. Yes. There are proposed regulations.

Q. And each state will have its own compliance targets, correct?

A. That's the -- our proposal, yes.

Q. And each state will have four building blocks to achieve those targets, correct?

A. No.

Q. Could you please explain why that statement is incorrect?

A. The four building blocks are used to determine what the rate limit is, it's not necessarily the mechanism by which compliance is achieved.

Q. Could you please explain what you mean by "rate limit"?

A. Each state has for a set of existing power plants a rate limit expressed in pounds per megawatt hour.

Q. Okay. And each state will have to come up with its own compliance plan, correct, to comply with that rate limit?

A. Yes. That's the proposal.

Q. Okay. And there are four generally accepted ways that are considered available to meet those compliance targets, correct?

A. What I would say is there were four determinations we refer to as buckets, which were used to calculate the rate limit that each state must comply with.

Q. Okay. And to meet each target, the state can either implement energy efficiency, heat rate improvements, it could impose a cap and trade program, or it could develop increased renewable generation, correct?

A. Yes, among other different compliance options.

Q. Can you explain what those different compliance options might be?

A. They could use existing -- new units in place of existing units, they could retire all their existing units, they could produce their output without increasing the output of gas plants. So there are many different compliance -- they can import power from other areas. There are many different compliance mechanisms that are available, including the ones that you mentioned, but not

limited to those.

Q. Okay. And feel free to tell me if this is confidential, but your workpapers contain a forecast of energy efficiency, correct?

A. Is there a specific reference?

Q. Well, there are tables in your workpapers related to energy efficiency demand response, correct?

A. Yes. But for the purposes of determining whether they're confidential or not, I need the specific reference.

Q. I guess my question is -- you also have a projection of the cost of carbon. And my question is: Are the energy efficiency projections that you have included in your workpapers the same energy efficiency assumptions that drive your carbon forecast? You feel free to say if that's confidential.

A. Again, I can't determine whether it's confidential or not until you have a specific reference.

Q. I guess I'm talking conceptually whether or not the workpaper assumptions that you've included for energy efficiency in each year with the PJM RTO,

whether those -- that is the exact same amount of energy efficiency that you anticipate will be implemented by each of the states within the PJM footprint to comply with carbon regulations?

MR. ALEXANDER: So, Mr. Oliker, if I could maybe clarify here just because you're on the phone, when you're talking about the CO2 workpapers, are you referring to the workpaper labeled "National Carbon Policy," which says "National CO2" at the top of it, which is a confidential workpaper?

MR. OLIKER: Yes. They're both -- yes.

MR. ALEXANDER: Okay. And for the Renewable Portfolio Standard workpaper you were discussing, are you referring to the workpaper labeled "Renewable Portfolio Standards," which then has a standard map of the United States?

MR. OLIKER: That was one of my questions, but I hadn't gotten there yet. I was actually talking about the energy efficiency table which is much further up in that workpaper. It's right after the peak demand forecast, but we might as well address renewable energy as well because that's one of the next questions.

THE WITNESS: Okay. I see the

reference. And could you repeat the question, please, or someone repeat the question?

BY MR. OLIKER:

Q. Sure. Let's start with what Trevor mentioned, the national carbon policy. You would agree that this part of the workpaper contains projections of the cost of CO2?

A. Yes. That is -- it is our projection of the dollar-per-ton number.

Q. I guess my question is below that you have renewable portfolio standards that are described. My question is: Does that renewable portfolio standards projection, as well as the energy efficiency projection that you've included further up in your workpaper, does that impact the forecast of CO2 or is it separate?

A. I think that it's separate in the sense that the renewable standards are the minimal requirements that we are assumed being met for the amount of energy that's coming from approved renewable sources state by state.

In our projections, the compliance is a -- is determined by the model based on a calculation of minimizing costs subject to having to

meet a carbon constraint.

Q. Okay. So if I can just clarify that, make sure I understand. When you developed the carbon cost projections, you assumed that the amount of renewable development contained in your workpaper would occur in determining the carbon cap and trade tax, correct?

A. We assumed there were state renewable portfolio standards similar, if not exactly the same, as the ones that are in the workpaper, but in addition the model had the option to increase the amount of renewable energy that would be employed on the system as part of the compliance program.

Q. I guess I'm not -- that's the part I don't understand. If it crosses over into confidential, please let me know, but when you determined the carbon -- the CO2-per-ton target, you assumed that renewable development would be achieved based on the mandates in each state, correct?

A. No. The target was set separate from -- in our analyses, it was set separate from the renewable targets, but the compliance is done in the model where there are options for renewable energy increases above the minimum required levels.

Q. Okay. And moving to energy efficiency, would you agree that if there is more energy efficiency implemented, then you can have a lower carbon cost, correct?

A. If -- for a given cost of an amount of energy efficiency, if you have for a given cost more energy efficiency, everything else being equal, you're going to have a lower marginal cost of complying with CO2 regulations.

Q. Okay. And I guess my question is: Do you have -- the energy efficiency assumptions that are in your workpaper, were those assumptions used at all in developing the cost per ton of carbon?

A. No. I don't believe they -- well, these numbers did not play a significant role in the determination of the CO2 price because they're so small. Most of the demand resources are interruptible load, but there is some energy efficiency, and I don't believe that it set the minimum reduction in energy use, but I -- I'd have to check.

Q. Okay. And if we were to look at -- going back to your forecast that you took from PJM for peak demand and net energy, do you know whether

that forecast includes any assumption of increased energy efficiency to comply with 111(d)?

A. The forecast that I used predates the announcement of 111(d), and I do not believe it incorporates any impacts from 111(d).

Q. So then would you agree that there's a possibility that PJM has still overstated peak demand and net energy usage?

A. In general forecasts can be over or under. And because they did not take into account 111(d), it's possible they may have overstated demand, but I'd have to give that some additional thought to see if it was a significant issue.

Q. Okay.

A. In part because the -- the analysis also assumes a continuation of the current regime, which is favorable to energy efficiency in which there is a possibility that energy efficiency won't be considered as payable by FERC-regulated entities at any time.

Q. Do you know whether states can provide compensation for energy efficiency?

A. Yes. I don't think there's anything related to this issue of demand resources that

effects the states except for they now have the responsibility for the pros and cons and costs of the programs, implementing them, et cetera, in a way that they didn't have under the -- or, don't have under their regime that's currently in place.

Q. Okay. Let's try to move ahead a little bit, and hopefully I can short-circuit this.

Did you assist the EPA and provide shadow prices for the price of carbon?

A. "You" being ICF, or "you" being Judah Rose?

Q. Judah Rose or ICF, either one works for me.

A. For ICF, yes; for Judah Rose, no.

Q. Are you familiar with those carbon prices?

A. Yes, I have some familiarity.

MR. OLIKER: Okay. I've tried to streamline this process, and, Trevor, I provided you two spreadsheets; one is the EPA spreadsheet and the other one is just a filtered down to include the carbon prices for each of the states. Do you have that spreadsheet, Trevor?

MR. ALEXANDER: One moment, please.

MR. OLIKER: It's titled: NSPS, at least in the file itself, and it's Filter Copy of Option 1 State.

MR. ALEXANDER: Yeah. They're printed out so that doesn't help me. Is it labeled "EPA 5.13 Version 3 Full Test"?

MR. OLIKER: I'm not sure. It's the smaller document of the two. At the very top page would say, "NSPS State CO2 Constraint-AL" on the first line.

MR. ALEXANDER: Let's go off the record for a moment.

(Discussion held off the record.)

MR. OLIKER: Let's actually try a different document. I just want to get through the documents while we have time.

I don't believe this is confidential. This was a document that says "Implications of Current Low Natural Gas Price Environment on Wholesale Power, Prepared for: Edison Electric Institute, May 3, 2012." Do you have that, Trevor? It's IGS-RPD-5 Attachment 3.

THE COURT REPORTER: Could you read that title again for me, please?

MR. OLIKER: Sure. It's "Implications of Current Low Natural Gas Price Environment on Wholesale Power." Let's mark that as Deposition Exhibit 8.

Trevor, the document that I e-mailed you contained actually two attachments, it's Attachment 3 and Attachment 4. If you printed them out that way, we can label them both as one, one exhibit, that's fine.

MR. ALEXANDER: Could you repeat that citation for me, please?

MR. OLIKER: This is IGS Set 1, it's an ICF International document, prepared on May 3, 2012, regarding the implications of current low natural gas price on wholesale power.

MR. ALEXANDER: We don't have it.

MR. OLIKER: It should have been in the second e-mail I sent.

MR. ALEXANDER: Okay. I thought I had those documents, but apparently I don't. So we'll have to address that over the break.

MR. OLIKER: Okay. Let's see. Moving on then, we'll deal with that later.

BY MR. OLIKER:

Q. Mr. Rose, are you familiar with the term a contract for differences?

A. Yes.

Q. You've testified about them in the past, haven't you?

A. I'm very familiar with the term. I may well have testified about them in the past, I don't remember it specifically, though, testifying. Is there a specific reference that you have?

Q. Well, I guess from a high level, could you describe what a contract for differences is?

A. Yes. It's a payment in which the payment is a function of a set number in the contract and the market price that results, and it's commonly used in markets that have nodal pricing and that type of arrangement.

Q. And would you agree that contract for differences increases financial risk for customers that must pay the difference?

A. No. I would not agree with that.

Q. And you didn't submit that testimony in New Jersey?

A. I -- I don't remember. And if you have a specific reference, I'll be glad to take a look at

it.

Q. That's okay. Trying to -- I'm going to pull this up and make sure I don't cross over, but are the coal forecasts that you have provided, those are confidential, correct?

A. Yes.

Q. Okay. Are you familiar with the rail constraints that currently exist in the Midwest for delivery of coal from the Powder River Basin?

A. I have some general knowledge of them, but not -- I have some general knowledge.

Q. Are you aware that FERC has opened a docket to address the rail constraints regarding Powder River Basin coal?

A. I have not seen that document -- that docket.

Q. I'm sorry, could you say that again?

A. I have not seen that docket.

Q. Okay. Would you agree, though, that due to the rail constraints, the coal pile levels throughout the Midwest are depleted with respect to Powder River Basin coal?

A. I don't have specific knowledge of depletion or levels sitting here. My knowledge is

limited to the fact that there's rail constraints related to large deliveries of oil in particular, and I don't have -- I know that the -- I'm not sure if I would use the word depleted, but the stocks may be lower, but I don't have the specific numbers in front of me.

Q. Did you -- have you done any analysis of the impact of the rail constraints to the coal pile levels in the Midwest?

A. No. I have not analyzed that specific issue.

Q. Okay. And you have developed a projection of capacity prices, but you have not made any sort of projection for any penalties of nonperformance that any generation units may experience, correct?

A. No. I don't have specific estimates for individual power plants of the performance penalties. It's a contributing factor to my view that the market -- capacity market will be different going forward, the existence of those penalties, but I have not made a specific estimate.

Q. Okay. Looking in your workpapers, are the natural gas price assumptions in your workpapers,

are those confidential?

A. Yes.

Q. Okay. In general would you agree that natural gas prices have decreased approximately 20 percent since you filed your testimony over the next several years?

A. I don't have a specific numerical estimate, but the last few weeks in particular -- last few days in particular, prices are lower than they were than when I did my analysis in August.

Q. Would you agree that natural gas is currently trading below $3?

A. Spot prices for Henry Hub are approximately $3.

Q. Would you agree that there are contracts trading below $4 out through 2020?

A. I don't have the specific numbers in front of me. They are below $4 for at least the first few years, but I don't have the specific numbers, and those are the -- I'm referring to the NYMEX Henry Hub contracts that are -- those prices have come down very recently.

Q. Would you agree that, all else being equal, those price decreases will also decrease the

amount of revenue that is available to coal-fired power plants and nuclear power plants?

A. Yes. If, and only if, they are sustained. There are reasons to believe that it's a temporary phenomenon. And so if they were sustained, which I don't believe they will be, then they would lower the revenues most probably.

Q. Okay. Turn to Page 7 of your testimony. You indicate, "Infrastructure investment in the natural gas industry is expected to increase natural gas prices in the supply pockets, decreasing new power plant margins from selling electrical energy and thus increasing net capacity costs."

In this statement, what infrastructure are you referring to?

A. I'm referring to both gas transportation, pipelines, as well as gas use infrastructure, as well as related infrastructure that's related to gas industry operations.

Q. What do you mean by "gas use infrastructure"? I'm sorry, I don't think I understand you.

A. Ethylene plants, petro-chemical facilities, natural gas power plants, things of that

nature.

Q. So is that assumption more related to once that infrastructure is in place, the demand will increase and that won't cause price to increase?

A. It's related to the fact that that infrastructure investment, all else being equal, the type that I'm referring to here, tends to reduce the price differences with -- in different locations. There are some supply pockets for which there's not adequate infrastructure, and that's what I'm referring to.

Q. With respect to Henry Hub, would you agree most shale gas is nowhere near -- first of all, do you know where the Henry Hub is located?

A. Yes.

Q. Where is it?

A. It's in Louisiana.

Q. Would you agree most shale gas is not located in Louisiana?

A. Yes. There is significant shale gas in Louisiana, but most is not located in Louisiana.

Q. And could you please explain what the term "basis" means?

A. I understand basis to be the difference

in price between one location and another.

Q. And that's what you're talking about with respect to supply pockets, basis differentials?

A. Yes, between the supply pocket and other parts of the industry and other locations.

Q. Okay. And when you say -- so going back to your statement, investment in the natural gas industry is expected to increase natural gas prices in the supply pockets, and here are you only referring to basis differentials for Henry Hub?

A. Here I'm only referring to basis differences in general. It turns out that all locations can be related by basis; so I'm focusing in on basis differences in certain supply areas in the northeast vis-a-vis other areas of the northeast, like demand areas.

It also then corresponds to less and different bases vis-a-vis Henry Hub. That's primarily what I'm focusing in on here with respect to infrastructure investments.

Q. Okay. On Page 8 you state, "...the decreasing amount of non-natural gas-fueled thermal generation capacity increases the difficulty of physical hedging." What analysis have you done to

support that statement?

A. I've observed the very large retirement of power plants.

Q. And what analysis regarding hedging instruments that are available today have you done to support that statement?

A. Well, power plants themselves can be physical hedges, and hedges in particular. I'm referring here to non-natural gas power plants. So to the extent that there are no or less natural gas power plants, there's less physical hedges that are available to mitigate that, and that's an important consideration in particular for long-term hedging.

Q. Okay. So, for example, my company sells electricity. You're not saying that I can't go out today and purchase a forward contract for electricity now, correct?

A. That's correct, you can purchase. But the liquidity in the marketplace is much higher in the very near term relative to the long term, in that an important source of these contracts are both positioned -- willingness, if you will, in a nonpejorative sense, speculators to take a position.

Also, more importantly, the willingness

and the ability to enter into offsetting physical hedges that underlie the -- these contracts. So to the extent that the physical hedges go away, there is less likelihood of having long-term, in particular, hedge contracts.

Q. Okay. Now, a moment ago we were talking about infrastructure investment in the natural gas industry decreasing basis differentials and supply pockets. Would you agree that that infrastructure investment will increase the --

THE COURT REPORTER: I'm sorry, could you repeat that?

MR. OLIKER: I'll start over.

BY MR. OLIKER:

Q. We were just talking about infrastructure investment in the natural gas supply pockets. Would you agree that as infrastructure investment increases, the amount of firm transportation available for natural gas power plants will also increase?

A. The amount of firm supply for gas transportation will increase, yes, and it's likely that it would lead to additional -- from contracting, everything else being equal, it's not a sufficient

condition, but it is -- increases the likelihood.

Q. Okay. And later you also make the statement: All generators participate in PJM on a hedged or on an unhedged basis. What do you mean by that statement?

A. Generators are selling power almost exclusively to PJM or through PJM. PJM is the immediate purchaser of their output. To the extent that that's done on an unhedged basis say, for example, on a day-ahead market, that's part of what goes on.

The other part is sometimes the sellers have hedges. Typically the hedges are short-term.

Q. Okay. You also talk in your testimony about increased natural gas demand regarding LNG exports globally, and then you say that that will drive up gas prices, correct?

A. Do you have a specific reference?

Q. I think it's on Page 19.

A. Yes, I see that. But it's not only that, it's -- that's not the only factor that's increasing demand. It's a significant factor, but it's not the only factor.

Q. Okay. Well, first let's talk about the

LNG export for that. Would you agree that shale gas has not only made it to the United States?

A. Yes.

Q. Would you agree it's in -- pretty much all over the world?

A. No. I -- I wouldn't -- wouldn't say that, but --

Q. Most of it, though, right?

A. Well, you know, I -- there are shale gas resources outside of the United States. I -- I don't have a percentage that's in the US versus non-US. It's pretty clear that a majority of the shale gas being produced worldwide is in the United States today.

Q. Okay. And would you agree that current oil prices -- currently oil prices are quite low relative to historic levels?

A. Yes. Today, well, prices are lower than they were earlier in the year for sure. Depends what time period you're looking at. In general compared to earlier in the year, they're lower.

Q. Would you agree that the current level of oil prices may have a tendency to reduce the shift to natural gas in the United States and globally?

A. That might be one of the effects, that it might mitigate the increase in demand. There are other offsetting effects that are relevant to the gas market. But I would say, all else being equal, there would be some diminution in the demand growth if oil prices were sustained at this level, and we -- not related necessarily to the current prices today, but if it was sustained over time and believed to be sustained over time, it would have some limit -- some diminution in the demand.

Q. And diminution to demand could also have a corresponding downward pressure in price, correct?

A. All else being equal, it's possible that it would, and -- but as I indicated, there were offsetting factors such as the lower oil price corresponds to the lower value for the natural gas liquids that's being produced with the gas, and that is having -- has the effect of raising the price of natural gas since there's less revenue available to offset the costs of producing natural gas; so there are offsetting factors.

And so it would have to be examined in the context of what is the level -- the decrease in the oil price, how long does it last, and it has to

be analyzed taking into account all of the effects.

Q. Would you agree that most of the gas in the Marcellus Shale is dry gas?

A. It's -- I guess what I would say is it's dryer than some gases, like the Eagleford, but it's not dry fully, and there are liquids that are coming out of the Marcellus.

Q. But it's dryer than most of the shale, correct?

A. I can't make that statement. I picked, you know, Eagleford, which is a very wet one, but my experience is that a lot of gas has some wet components, some natural gas liquids. Those revenues offset the cost of producing the gas. So that's a factor that our modeling would have to take into account for a given level of oil prices.

Q. Okay. Just a few more questions, and then I think we can break.

Page 19 you state that, "New FERC policies limiting DR participation in capacity markets will increase capacity prices in those markets." Could you identify specifically which FERC policies that you're referring to in this statement?

A. Yes, to a certain degree. There are

certain FERC decisions already made that I believe I referenced in January and March of this year that limit and/or change the role of DR in the marketplace and how it's handled.

There are the changes in FERC policy that are required by the District of Columbia Circuit decision of May 23rd and the subsequent reaffirmation not to review it en banc and -- which would also effect DR participation. So there are a number, the capacity performance proposal, which was discussed earlier also would change and limit the DR participation relative to the policies that have occurred in the past and which have been so problematic and damaging to the -- to grid reliability.

Q. Anything else?

A. Sitting here now, those are the ones that come to mind. I believe I've referenced some of them in other material I provided.

Q. Okay. And regarding the January and March decisions from FERC, would you agree that those were already in effect for the last base residual auction, if you know?

A. Yes, I believe for sure the January

decision was; the March one I am not sure; and, of course, the prices were higher in the May 2014 auction than they were in the previous auction.

Q. In the $120 range; is that right?

A. Right. They were approximately double what they had been in the previous auction for the RTO region, about $42 a kilowatt year.

Q. Okay. And you touched briefly on the DC Circuit. You would agree that that decision was related to compensation from the energy markets, correct?

A. Yes. But having reviewed the complaint filed by FirstEnergy and the reaction to that PJM, which is described -- the application of that doctrine or theory to the capacity markets as being foreseeable and requiring FERC -- FERC-approved contingency planning, I'm taking into account those decisions, actions, and while I'm also agreeing that the -- the immediate decision affected energy. As we discussed, capacity is supplemental or complementing market relating to energy; and, therefore, there's a significant probability that the doctrine or approach would apply also in the capacity markets.

Q. You're not a lawyer, are you, Mr. Rose?

A. No. I'm not a lawyer, and I don't intend in any way to give legal opinions, but I'm basing it based on the knowledge I have in the markets, et cetera.

Q. Is it your opinion that if FERC cannot regulate demand response, that demand response will disappear completely and have no impact in capacity prices?

A. No, and that's not our forecast.

Q. Are you familiar with FirstEnergy's interruptible tariff?

A. No, I'm not.

Q. Would you agree that a rational economic market participant, given two sources of revenue, they will pick the higher source, all else being equal?

A. Yes. I think that's a reasonable generalization.

Q. Okay. And assuming states regulated demand response and the compensation that was available to market participants through the state-regulated mechanisms was higher, would you agree, all else being equal, that participation will remain the same or increase relative to FERC-related

demand response?

A. Yes. I don't think that's the likely outcome because of the numerous subsidies that were provided by FERC. I think it's more likely that the incentives and structures will be less favorable to DR under implementation of the Attleboro doctrine of separation between retail and wholesale as applied to the DR.

Q. What analysis have you done to determine that revenue available to demand response participants will be less under state regulation?

A. Well, given consideration to the very large subsidies that effectively FERC provided to DR, such as providing essentially the same capacity price, albeit inadvertently, to the DR, even though it wasn't required to do more than 60 hours of service under very limited conditions during the summer, an option which was denied to generators, and there were other aspects of the support given to DR which I believe is less likely to be given by the states and certainly not in the immediate term.

Q. Mr. Rose, do you know that a stipulation and recommendation has been filed in this proceeding?

A. Yes. I've heard that.

Q. And so you were not aware that the stipulation and recommendation proposes to continue Rider ELR, which provides compensation, demand response resources, in excess of $300 a megawatt day?

A. I am not aware of that.

Q. So would you agree that it's possible that a state mechanism for demand response compensation can be greatly -- it can greatly exceed the PJM RPM price?

A. It's possible, but not likely on average across the PJM region.

Q. And, again, what analysis have you done to support that statement?

A. As I indicated, I focused in on the support and subsidies provided by FERC, and also the difficulty in -- of allocating responsibility, of setting up state programs, of providing the same level of incentives, and the allocation of who's responsible if the demand resources and particularly interruptible load don't perform, or in particular if they opt out, who's responsible for that.

All of those considerations lead me to think it's not likely that the -- there will be a decrease -- it's not likely that there will be an

increase. In fact, it looks like there will be a decrease. And that decrease, while it's confidential, is included in our forecast.

Q. Okay.

MR. ALEXANDER: Mr. Oliker, before you move on here, the witness has been going for about five hours so far. I'd like to stop for lunch literally unless you're, you know, within one or two questions.

MR. OLIKER: I've got two questions, Trevor.

MR. ALEXANDER: Okay. That will be fine.

BY MR. OLIKER:

Q. Okay. In your testimony, you talk about having a reduction on capacity prices as a result of PJM changing its tariff for capacity imports, correct?

A. No; the opposite.

Q. I'm sorry. Let me restate that.

Your testimony claims that capacity prices will rise because PJM has changed its tariff and reduced the amount of capacity resources that are eligible to import capacity, correct?

A. Yes. All else being equal.

Q. And you would agree that PJM changed its tariff prior to the -- and you would agree that PJM changed its tariff prior to the last base residual auction.

A. Yes. With respect to the transmission imports, the answer is yes.

Q. Okay. And just briefly, on Page 26 in your testimony -- sorry, Trevor, actually it's two more questions -- you include gas prices from 2007 through 2014, I believe. Isn't it true that 2007, 2008, 2009, that all occurred before the impacts of shale gas, correct?

A. It occurred before the large increase of shale gas, but some of the features of that volatility are things that are unlikely to have changed; so, for example, hurricanes and changes in fuel prices.

Q. Is it your opinion that hurricanes will impact shale gas production?

A. No. But it affects offshore production and, therefore, it affects gas prices, and that's what's being addressed here.

Q. Okay. But would you agree that through

2010 to 2014, there would be a significantly smaller deviation than from 2010 -- 2007 to 2014?

A. The highest prices ever experienced in North America occurred during the last winter, which is, you know, many years after the 2007, 2008. So there's significant sources of volatility in the gas market, including new sources of volatility that have reached record levels over the last 12 months.

Q. Now --

MR. ALEXANDER: You're at four questions since your two questions.

MR. OLIKER: Yeah. We can either do the rest after, or one more question and then I'm done, Trevor.

MR. ALEXANDER: Okay.

MR. OLIKER: One more.

BY MR. OLIKER:

Q. Okay. In your testimony you also talk about 26,000 megawatts that's retired, and that all of that will retire by I believe you said the end of 2016, correct?

A. I believe it's April 2016. If you have a specific reference, I could look at that. I don't believe it's 26,000, I think it was 27,000, but the

main idea is that the MATS regulations have a deadline of April 2016.

Q. And you would agree that a unit that is going -- all the units that are going to be retired by 2016 will not have bid in the most recent PJM RPM auction?

A. I believe that's the case. I don't -- I don't have the -- the bidding is confidential, but I believe that's the case.

Q. Okay. Now, I can save the rest for after lunch. Hopefully that will be pretty quick in the public section once we have those additional documents.

MR. ALEXANDER: Okay. Let's break until 2:00 o'clock.

MR. FISK: Sounds good.

MR. OLIKER: Sounds good. Thanks.

(Luncheon recess.)

- - -

Wednesday, January 7, 2015,
Afternoon Session.
- - -

BY MR. OLIKER:

Q. Sure. Before we move onto the documents that we were discussing previously, just a few additional follow-up questions.

In your testimony, you talk about capacity not being built west of the Appalachians, correct?

A. Yes. Do you have a particular citation?

Q. I feel like it's on Page 45, but give me a moment to double-check. It is on Page 45.

A. Okay. I see it.

Q. You say, "A detailed treatment of transmission is especially required due to the large amount of coal power plant retirements west of the Appalachian Mountains." Then you mention that there will unlikely be many new builds west of the Appalachians. Could you explain the analysis you've done to support that statement?

A. Yes. I reviewed the planned firm new natural gas power plant builds by location, and found the -- one or two exceptions, they were located to

the east of the Appalachians.

Q. And so as I understand your answer, if it wasn't included as a firm build within PJM, then you did not consider it?

A. In this analysis, which is a near-term analysis, I focused exclusively on the plant or firm -- we considered firm natural gas power plant builds.

Q. Did you review applications before the Ohio Power Siting Board?

A. No.

Q. Okay. When you use the term -- how many plants did you identify in megawatts west of the Appalachian Mountains?

A. There's a -- one or two firm power plants, and there's some -- I don't remember exactly.

Q. Do you know which states they're located in?

A. I don't remember.

Q. Okay. Well, maybe here's a better way to do it, because I don't think this is -- I don't think this is confidential. This is in your workpapers, you're talking about PJ firm builds, correct?

A. PJM firm builds, yes.

Q. Okay. Well, as I'm looking at that document in your workpapers, are the numbers in each years in megawatts or is that the total amount of units?

A. You're asking me about the table that says "PJM Firm Builds"?

Q. Yes, I am.

A. The numbers are in megawatts.

Q. Okay. So -- and -- and the ISO zone will tell us which part of PJM we're talking about, correct?

A. Yes.

Q. And ATSI is not specifically listed, correct?

A. No.

Q. And is that because there were no firm builds in the ATSI zone?

A. Correct.

Q. Okay. And as far as your modeling of additional construction -- let me take a step back from that.

Your -- did you look at the PJM generation queue at all?

A. Yes, I believe so.

Q. Would you agree there's over 60,000 megawatts in the PJM generation queue?

A. I don't -- I don't remember the number that's in there.

Q. Would you agree -- if I compare the PJM firm builds of -- I believe at the bottom right-hand corner total is 7,775, would you agree that assuming only 7,700 megawatts of construction between now and 2017 is a conservative estimate about approximately 11 percent, maybe 12 percent?

A. No.

MR. ALEXANDER: Objection to form.

THE WITNESS: No.

BY MR. OLIKER:

Q. Why not?

A. PJM has announced that even units that I considered firm are delayed and not going to be available on time. It's part of their recent filing.

Q. Which recent filing are you referring to?

A. Either the December 12th or the December 24th one, I don't remember which one.

Q. And by the December 12th to December

24th, which proceedings were those in?

A. They're in FERC dockets related to the capacity performance, and what I would characterize as the emergency actions that they are trying to take in the event that the EPSA decision is applied to the capacity markets.

Q. Okay. And how did you determine generation construction besides going out after 2017?

A. The model forecasts nonfirm builds.

Q. Does that model also -- scratch that.

Does that model consider the PJM generation queue?

A. Not directly. It affects the -- that affects our decision about the firm builds, but the nonfirm builds are made based on cost minimization.

Q. Okay. On the subject of the construction generation, are you familiar with what an IGCC plan is?

A. Yes.

Q. Could you define it?

A. Integrated gasification combined cycle.

Q. In the past you testified in favor of building IGCC plants, correct?

A. Do you have a specific reference?

Q. I don't have a specific one, but I'm just asking in general if you have.

A. I have testified in cases involving IGCC. In the most recent case, it was related to a specific input parameter the company used and not related to a specific decision, I don't believe.

Q. Have you ever testified in support of construction of an IGCC plant?

A. Yes, in Minnesota.

Q. And it -- did you testify that that plant would be economically competitive?

A. I don't remember. It was a long time ago.

Q. Do you know the year or general idea of the timing?

A. January 2002.

Q. Okay. Thank you.

Would you agree that in current markets IGCC plants are not competitive relative to coal plants or natural gas plants for recovery of fixed and variable costs?

MR. ALEXANDER: Objection; beyond the scope of his testimony. Go ahead.

THE WITNESS: Could you repeat the

question?

BY MR. OLIKER:

Q. Would you agree that in current market conditions, IGCC plants are not competitive relative to coal and natural gas plants for recovery of their fixed and variable costs?

MR. ALEXANDER: Objection; beyond the scope of his testimony. Go ahead.

THE WITNESS: I don't think it's de facto legal to build new coal power plants in the United States, and that applies to IGCC, as well as other coal plants.

BY MR. OLIKER:

Q. Are you -- is that your answer or your attempt to answer?

MR. ALEXANDER: Objection.

BY MR. OLIKER:

Q. I guess my question is: If you compare the profitability of an IGCC plant for recovering its fixed and variable costs compared to a natural gas plant or a coal plant, would you agree the IGCC plant is much less competitive?

MR. ALEXANDER: Objection; asked and answered. Go ahead.

THE WITNESS: The cost of an IGCC has to include carbon capture and sequestration, and under the current law, and I think those costs make it essentially prohibitive to consider coal power plant construction generally.

BY MR. OLIKER:

Q. And, again, I would still like an answer to my question of the competitiveness of an IGCC plant relative to other power plants.

MR. ALEXANDER: The question has been asked and answered twice.

MR. OLIKER: He's not provided an answer.

BY MR. OLIKER:

Q. Okay. Let's take it in steps. Would you agree that an IGCC plant has a higher cost of construction than a natural gas plant?

A. Yes.

Q. Okay. And would you agree that if all power plants -- if you're considering whether or not a natural gas plant in today's market would recover its fixed and variable costs, it is more likely to recover them than an IGCC plant?

MR. ALEXANDER: Objection; asked and

answered. For the last time, go ahead.

THE WITNESS: Are you referring to new or existing plants?

BY MR. OLIKER:

Q. Existing plants.

A. You're referring to a new gas combined cycle?

Q. Already existing.

A. Gas-fired combined cycle?

Q. Put it this way, that plant you testified to in Minnesota, let's move that plant to PJM and let's put it next to a combined cycle gas plant, they both have to recover their fixed and variable costs. Would you agree that the natural gas plant is much more likely to do that?

MR. ALEXANDER: Objection; beyond the scope. Go ahead.

THE WITNESS: Yes.

MR. OLIKER: Thank you.

Okay. Moving to -- Trevor, at this time would you provide him the Excel spreadsheet which is containing CO2 pricing.

MR. ALEXANDER: I believe we're on Exhibit No. 8.

(EXHIBIT MARKED FOR IDENTIFICATION.)

BY MR. OLIKER:

Q. Mr. Rose, understanding that for ease of this deposition this is a very small subset of a larger document, but would you agree that the document that is provided to you as Exhibit 8 contains a set of shadow prices that ICF provided to the Environmental Protection Agency for each state for the price of CO2?

A. One second, I'm reviewing it. It looks that way, but I can't be sure. It looks that way, but I don't remember looking at this specific set of numbers before.

Q. Right. And just for the record, you provided a discovery response, I believe it was Sierra Club Set 2 - Interrogatory 65, that describes what steps a person needs to go to to get to this information on the ETS website, correct?

A. Yes. You know, if you need more information on that, I have to look at the actual discovery response, but I did -- I do believe I did that.

Q. Okay. First of all, I guess what is the shadow price summary? What does that pertain to for

the EPA?

A. It's a -- the shadow prices are the marginal costs of various different constraints that they have in their model.

Q. And what does their model do?

A. Well, it's an ICF model, but it's their assumptions with respect to the nature of the constraints and the other input assumptions. With that clarification, could you repeat your question?

Q. Yeah. You're -- I asked you what is the shadow price summary, and I believe you said it pertains to the constraints in our model. First thing is what constraints are you referring to?

A. Well, this is primarily environmental constraints; so it's the shadow prices for environmental constraints. There are other constraints in the model.

Q. So this -- are you saying that these are the prices that you provided the EPA for compliance with individual state mandates under 111(d)?

A. "You" being ICF and --

Q. Yes.

A. -- and -- I believe that this is what the material is, it's for constraints under 111(d)

and other constraints.

Q. Okay.

MR. ALEXANDER: Mr. Oliker, just to be clear, that's subject to the clarification that the EPA provided the inputs?

MR. OLIKER: Yes. Correct.

MR. ALEXANDER: Okay.

BY MR. OLIKER:

Q. Now, if we look at Ohio, would you agree that in 2020, which is the first implementation year, it says $7.27 per ton. I guess first of all, what does the units of measure, US2011 dollars per ton, how does that impact this number?

A. 2011 dollars per ton refers to real 2011 dollars, and it's per ton of CO2.

Q. Okay. So -- so in today's world, the $7.27 number would actually be higher?

A. In 2015 dollars, it would be higher, yes.

Q. Okay. And as I look at the $7.27, what I find interesting, and I'm hoping you can help me out with, if you go down to Pennsylvania just a few lines down it's 24.75 a ton. Can you describe the discrepancy between Pennsylvania and Ohio?

A. The specific discrepancy, no. There are state-specific limits and state-specific conditions that can cause the difference in dollar per ton.

Q. So going back to 7.27, are you aware of the assumptions that were included to come to this number?

A. I mean, there's a, you know, essentially infinite number of assumptions that are associated with this. I know some of them and some of them I don't.

Q. Which ones do you know? If that's confidential, we can talk about it later. I just don't know whether it is or not.

A. I'm finding the question too broad.

Q. Can you try to provide some description of how the $7.27 number was arrived at?

A. There is a state-specific limit that is implemented in one of the EPA cases which I'm assuming that this is that case, and that state-specific limit is an emission rate limit in pounds per megawatt hour, and then there's a marginal cost in each year of complying with that limit, and there are numerous different assumptions in there, but that's the basic methodology.

Q. Was one of the things the EPA assumed that Ohio would meet all of the renewable energy and energy efficiency targets that were in place in 2013 before Senate Bill 310 was passed?

MR. ALEXANDER: Objection; well beyond the scope. Go ahead.

THE WITNESS: I -- I don't remember what specific renewable assumptions were used to establish the rate and limit.

BY MR. OLIKER:

Q. Do you remember the energy efficiency assumptions?

MR. ALEXANDER: Same objection.

THE WITNESS: No, not the specific ones.

BY MR. OLIKER:

Q. Well, do you agree that the EPA has assumed a higher level of heat rate improvement than most experts believe is possible?

MR. ALEXANDER: Same objection.

BY MR. OLIKER:

Q. You can answer.

A. Yeah, no. Some experts think the number's high, but I don't have an ability to answer that question as it was asked.

Q. Okay. Here's another question: If the Pennsylvania CO2 limit is $24, in Ohio it's $7.27, would you agree that that is likely to cause Ohio generation to dispatch more in the short term?

MR. ALEXANDER: Same objection.

THE WITNESS: Yes. There's some ambiguity about the treatment of how imports and exports are handled, but it's possible that it would give an incentive to Ohio generation.

BY MR. OLIKER:

Q. And isn't it true that if Ohio generation does increase its dispatch, then the likely result is to have to increase the CO2 price in the following year?

MR. ALEXANDER: Objection -- same objection.

BY MR. OLIKER:

Q. In Ohio, that is, we're talking about.

A. No. I don't believe that's the case.

Q. Why not?

MR. ALEXANDER: Same objection.

THE WITNESS: The -- once the rate limit is established, it's -- under the proposed rules it's established, it's not a -- a function of the

emissions in that given year.

BY MR. OLIKER:

Q. So your testimony is that you may exceed your emission limit in a given year?

MR. ALEXANDER: Same objection.

THE WITNESS: No. You -- your -- your emission limit in pounds CO2 per megawatt hour is not changed based on your behavior in that year.

BY MR. OLIKER:

Q. So if generation in Ohio, if the output increases to serve load in Pennsylvania and then Ohio exceeds its emission amount, wouldn't it have to increase its cost of CO2 per ton --

MR. ALEXANDER: Objection.

BY MR. OLIKER:

Q. -- to prevent that from happening in the future?

MR. ALEXANDER: Objection to form; and objection, it's beyond the scope of his testimony.

THE WITNESS: No.

BY MR. OLIKER:

Q. Why not?

A. I don't accept the premise that they're going -- can exceed their emission rate limit. That

was the first reason for no. And it's a pound-per-megawatt-hour limit so you can provide more megawatt hours.

Q. Are you familiar with what happened with the United Kingdom with their CO2 and in Europe?

MR. ALEXANDER: Objection; vague.

THE WITNESS: Can you be more specific?

BY MR. OLIKER:

Q. Would you agree that in Europe emission prices were set too low, and they had to increase them drastically to ensure they had compliance targets?

MR. ALEXANDER: Objection. Go ahead.

THE WITNESS: I'm not familiar with England enough to answer that question.

BY MR. FISK:

Q. You did not personally create these CO2 prices, correct?

A. Yes, that's correct.

(Confidential Portion Excerpted.)

(Public Record.)

BY MR. OLIKER:

Q. Okay. Let's move to the other document that I provided you, which is Implications of Current Low Natural Gas Price Environment on Wholesale Power. And I believe this document is IGS Set 1-RPD-5 Attachment 3, and I'd like to mark that as Deposition Exhibit 9, I believe.

(EXHIBIT MARKED FOR IDENTIFICATION.)

MR. OLIKER: We're still waiting, Trevor?

MR. ALEXANDER: Yeah. He's reviewing the document.

BY MR. OLIKER:

Q. Okay. I guess while you're reviewing, Mr. Rose, can you tell me whether or not this appears to be a true and accurate copy of a document produced by ICF International titled "Implications of Current Low Natural Gas Price Environment on Wholesale Power"?

A. It does. There's some oddities in the documents. Like, on Page 15, there's no title, I don't think that that's a full printing, and same thing on Page 14.

Q. So I guess let me ask you this, this will help: My version on Page 15 says "PJM Natural Gas Combined Cycle Capacity Factors 2009 to 2011." Actually before we go, is this a confidential document, because it's not labeled so?

MR. ALEXANDER: I don't believe it is.

THE WITNESS: I'd prefer to -- first of all, my Page 15 doesn't read as you indicate, that's number one. Number two is I prefer to deal with this in the confidential docket. It is something that was provided, and it's an internal document of ICF that we gave.

BY MR. OLIKER:

Q. This says it was -- I'm sorry, I didn't mean to interrupt you. The title of my document says, "Prepared for: Edison Electric Institute, May 3, 2012."

A. Correct. So you're not part of the Edison Electric Institute, are you?

Q. No. That's my question. If you think

it's confidential, I'm fine to do that.

A. Yeah.

Q. I just wanted to make sure we're talking about the same document.

A. Right. Let's deal with this in the confidential section.

Q. Okay. Let's at least finish marking it, I guess. Can you go -- because this is actually two documents, and this one may or may not be confidential.

If you go to -- on mine it's after Page 34, actually after Page 35, it also contains IGS Set 1-RPD Attachment 4, and that presentation is titled "Anticipating the Next Turn in a Gas-Rich Environment, Key Pricing Drivers, and Outlook," and it's prepared for Houlihan and Lokey Merchant Energy Conference. Let me know when you're there, tell me if that's also confidential.

A. I think that we can deal with it in a nonconfidential manner. It has the same printing problems or the -- in some cases as the other document, Page 8, but why don't you ask your questions and see if we can deal with it.

Q. I'm going to stay away from that page.

I want to go to Page 17. The title of that one says "Coal Power Plant Margins-PJM."

A. Unfortunately I don't have that title. I have Page 17, it doesn't have that title.

Q. Do you have the table?

A. I do, and for some reason it doesn't have numbers in the right-most column.

Q. Neither does mine under EBITDA. Is that the one you're referring to?

A. Yeah.

Q. Yeah. Mine does not, either, so I don't believe they were included.

A. Right. I mean, you know, I --

Q. I'm sorry. Go ahead.

A. I don't think that I would have given this document to that conference; so I'm not sure why it doesn't have a number -- numbers there, and the heading I don't know why is a problem, either.

Q. Maybe -- maybe one of the ways we can deal with this is to -- because I've e-mailed these to Trevor, you may be able to look at them when we take a break to determine whether the one that is printed is the same as the actual document. But I can tell you the EBITDA numbers that is contained in

the one that you said is confidential, they are listed, but they are not listed in the one that we are discussing now, which is the second presentation. So is that helpful?

A. Yeah. But I think we should deal with it -- let's deal with it in the confidential section.

Q. That's okay. That's fine.

MR. ALEXANDER: Okay. Does that resolve the public portion?

MR. OLIKER: I'd like to -- I just want to ask one or two more questions about something else, and then I'm done just about.

MR. ALEXANDER: Okay.

BY MR. OLIKER:

Q. Mr. Rose, again, this may cross over into confidential, I don't think it will, but you testified regarding the impact of nitrogen oxide regulations, you know, NOx, correct?

A. Yes. Do you have of a specific reference?

Q. I think it's in your workpapers, but I'd like to talk more high level about it. I don't think we need to get into the workpapers. You do provide an estimate of the impact of these regulations,

correct?

A. In my career, I've assessed the impacts of NOx regulations, yes.

Q. Okay. Well, regarding NOx regulations, coal-fired power plants install something called selective catalytic reductions to deal with NOx regulations, right?

A. That's one compliance mechanism, right.

Q. What are the other compliance mechanisms?

A. Well, there's SNCR, selective noncatalytic reduction, there are no-NOx burners, there's fuel switching, there's over-fired air. So there are more than one NOx-emission reduction mechanism.

Q. Have you reviewed FirstEnergy's proposed -- have you reviewed the Sammis power plant or OVEC power plants to determine whether any of them will require additional environmental measures to comply with NOx regulations?

A. No, I haven't, not as part of this exercise.

Q. Would it be -- if a coal plant does not have controls in place to deal with NOx regulations,

what is the likelihood of that plant being able to operate between now and 2031 without installing additional environmental measures?

A. I would need more information about the specific conditions to assess that.

Q. What if I had no other mechanism to deal with NOx?

A. Again, I would need to know the specific conditions.

Q. What specific conditions would you need to know to answer that question?

A. What are the likely environmental regulations that are facing that individual plant, what are its cost revenues, what are its NOx controls, what are its NOx control options.

Q. I guess my point is if it has no NOx controls, if it does not have an SCR or anything else.

A. You know, again, I need more specific information to answer that.

Q. And what if it has no NOx controls and it anticipates that it will run at a 75 percent capacity factor?

A. Again, I need more information in order

to assess the plant's conditions.

Q. Can you describe a set of circumstances that would require a plant to install a SCR mechanism?

A. There are some regulations that if applied to the particular power plant could result in NOx-emission requirements; there's visibility rules, there's ambient air quality standards, there's new source review standards, there's NSPS standards. So I would have to know the specifics of the power plant in addition to the -- and other information to assess the economic viability.

Q. Okay. I think that's -- just give me one minute, and I think I'm done with the public version.

(Pause.)

Q. One last question: You talked about volatility in PJM-dense markets and the gas markets in the PJM region. Would you agree that that volatility is largely related to constraints?

A. What type of constraints?

Q. Would you agree that the volatility is largely limited to constrained areas?

A. Can you just elaborate on what you mean

by "constrained areas"?

Q. Sure. For example, we're talking about pipeline constraints. Would you agree that volatility was necessarily present in all of the PJM footprint?

A. It was more prevalent in the areas that were most constrained for delivery capacity, but it wasn't limited only to those areas.

MR. OLIKER: Okay. That's all I have in the public; so leave it up to you guys whether you want to take a break or just keep plowing through on the other line.

MR. ALEXANDER: Let's take a break.

MR. OLIKER: Do you need us to call in on the other number?

MR. ALEXANDER: Let's end the public version at this point.

MR. FISK: Can we clarify on the record first what was marked Exhibit 9, are we leaving that?

MR. ALEXANDER: We're leaving that as one exhibit.

MR. FISK: Is it Exhibit 9, though, given that it's not going to be talked about until the confidential point?

MR. ALEXANDER: It's Exhibit 9. It's been marked and identified so let's just keep it with that number.

MR. FISK: Keep going with that. And it will just be on the confidential.

MR. ALEXANDER: We can talk about any of the exhibits on the confidential to the extent that we need to, but that's what we'll mark it.

MR. FISK: Okay.

MR. ALEXANDER: At this point let's go off the record for the public version. So we're off.

(Discussion held off the record.)

(Confidential Portion Excerpted.)

State of Ohio :
: SS:
County of :

I, Judah L. Rose, do hereby certify that I have read the foregoing transcript of my deposition given on Wednesday, January 7, 2015; that together with the correction page attached hereto noting changes in form or substance, if any, it is true and correct.

_____
Judah L. Rose

I do hereby certify that the foregoing transcript of the deposition of Judah L. Rose was submitted to the witness for reading and signing; that after he had stated to the undersigned Notary Public that he had read and examined his deposition, he signed the same in my presence on the _____ day of _____, 2015.

_____

Notary Public

My commission expires _____, _____.

- - -

CERTIFICATE

State of Ohio :
: SS:
County of Muskingum :

I, Carolyn D. Ross, Registered Professional Reporter and Notary Public in and for the State of Ohio, duly commissioned and qualified, certify that the within named Judah L. Rose was by me duly sworn to testify to the whole truth in the cause aforesaid; that the testimony was taken down by me in stenotype in the presence of said witness, afterwards transcribed upon a computer; that the foregoing is a true and correct transcript of the testimony given by said witness taken at the time and place in the foregoing caption specified and completed without adjournment.

I certify that I am not a relative, employee, or attorney of any of the parties hereto, or of any attorney or counsel employed by the parties, or financially interested in the action.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Columbus, Ohio, on this 14th day of January, 2015.

Carolyn D. Ross, Registered Professional Reporter and Notary Public in and for the State of Ohio.

My commission expires April 3, 2019.

(CDR-77434)

Summary: Deposition (Public) of Judah L. Rose electronically filed by Mr. Tony G. Mendoza on behalf of Sierra Club