ILLINOIS POLLUTION CONTROL BOARD

August 16th, 2006

IN THE MATTER OF:	)
	)
PROPOSED NEW 35 ILL. ADM. CODE 225 CONTROL OF EMISSIONS (Rulemaking-Air) FROM LARGE COMBUSTION SOURCES (MERCURY),	) R06-25))))

TRANSCRIPT OF PROCEEDINGS held in the above-entitled cause before Hearing Officer Marie E. Tipsord, called by the Illinois Pollution Control Board, pursuant to notice, taken before Cheryl L. Sandecki, CSR, RPR, a notary public within and for the County of Lake and State of Illinois, at the James R. Thompson Center, 100 West Randolph, Assembly Hall, Chicago, Illinois, on the 16th day of August, A.D., 2006, commencing at 9:00 a.m.

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HEARING OFFICER TIPSORD: Good morning. My name is Marie Tipsord. And seeing that it is the usual suspects today, I am not going to go through the whole spiel today.

This is our third day in our second set of hearings. We currently have before us testifying J.E. Cichanowicz.

The remaining witnesses in the order of appearance are Ishwar Prasad Murarka, William DePriest, James Marchetti, Krish Vijayaraghavan, Gail Charnley, Peter Chapman, Richard McRanie, C.J. Saladino and Andy Yaros.

With that, I would remind you, Mr. Cichanowicz, you are under oath and you will proceed. I believe we are on question 14.

MR. CICHANOWICZ: Thank you. On page 4 you state "further, table 5-1 and section 5.6 summarizes the significant ESP modifications, in some cases complete ESP replacements, implemented to six of the most frequently cited demonstrations."

Question A, have you made a comprehensive evaluation of the ESP activities of all of the test programs cited in the Illinois EPA TSD? No.

B, if not, why? Lack of time and access to information on the sites.

C, what is unique about these six facilities? These facilities are among the most frequently cited, at least according to my observation, or represent early applications and should be as they have provided encouraging results.

Question 15, you further state on page 4, the fourth paragraph, that there are a confluence of events that must occur for IEPA regulation to be attainable. If ACI within small ESPs in Illinois were able to sustain carbon injection and provide mercury removal on a long-term basis sufficient to meet the requirements, why would the other things have to happen as well? If this were true, wouldn't the other issues be limited to the two hot-side units and, therefore, be much

less of a concern?

If small ESPs in Illinois are able to sustain carbon injection and provide mercury removal on a long-term basis. And if is the key word, the importance of the other issues will be significantly diminished.

16, you further state on page 4 that your expected costs are $1.77 billion. Is it true that most of the differences in your expected costs versus Illinois' estimated costs is attributable to differences in opinion regarding the performance and reliability of sorbent injection to provide mercury reductions when injected upstream of an ESP?

Yes, in that a greater number of TOXECON applications are required.

MR. AYRES: Mr. Cichanowicz, welcome back, I guess.

MR. CICHANOWICZ: Good morning. Nice to see you again, Mr. Ayers.

MR. AYERS: Good morning. I want to follow up on that question with a couple

of additional ones. In light of the large difference in cost to the 1.77 and the figure cited by witnesses for the State, wouldn't it be a good idea to perform tests of sorbent injection on the power plants of interest in order to determine whether fabric filters will be needed?

MR. CICHANOWICZ: Well, I am not sure what you mean. But we have -- we have stated that basically the more number of demonstration-type tests that are available, the more data we have and the more confidence with which we can make such judgments.

MR. AYRES: Well, in particular in Illinois, we are talking about a very large difference in the estimated cost. Wouldn't it be useful to have some test done in the plants in Illinois that you are concerned about?

MR. CICHANOWICZ: Yes.

MR. AYERS: Do you know if there are any power plants in Illinois that you have testified on behalf of that have conducted

such tests?

MR. CICHANOWICZ: I believe there is work going on at Will County either in progress or being planned.

MR. AYRES: Could you provide the data from those tests to the Board?

MR. CICHANOWICZ: I don't have access to that data. Let me make it clear that the data that I have used is that which is available basically in the public domain pretty much as released by the Department of Energy through its website or as we have used in conferences. And we will follow up that in detail in a few more minutes.

But the point is that I have pretty much used the data that was available either going to a conference or public. My last discussions with the people involved with Will County were such that, you know, they weren't in a position to release any data because everything -- there was a lot of preliminary work going on. But it was just that, preliminary.

MR. AYRES: Would the Board like to ask for that data from the company?

HEARING OFFICER TIPSORD: And which company?

MR. ZABEL: Will County belongs to Midwest Gen. I have to see if there is even any data available. To my knowledge, the tests are just starting.

HEARING OFFICER TIPSORD: Will you check with that, please? Mr. Nelson, before we move on, are you able to hear Mr. Cichanowicz out there okay? Because sometimes I am losing a little bit.

Mr. Nelson, please identify yourself for the court reporter.

MR. NELSON: I am Sid Nelson with a company called Sorbent Technologies. Will County is planned for the spring. The Crawford Station is the one that is ongoing right now. It is the Crawford data which you will want to see.

HEARING OFFICER TIPSORD: Is that a question?

MR. NELSON: I am sorry, the

question is I am not -- are you aware of the Crawford trial that is ongoing?

MR. ZABEL: We will stipulate to Mr. Nelson's answer to his own question.

HEARING OFFICER TIPSORD: Okay. Thank you.

MR. CICHANOWICZ: I want to thank Mr. Nelson for correcting me. Crawford was what I meant to say, and it came out Will County. That is going to happen a lot.

HEARING OFFICER TIPSORD: Thank you very much. I believe we are ready to continue.

MR. CICHANOWICZ: 17, on page 4 of your testimony, you refer to figure 5-2 of your testimony as evidence that ESP size has an impact on mercury capture from ACI. Please provide for each of the data points on 5-2 the following: A, name of facility; B, sorbent type, open parenthesis, Darco-LH, B-PAC, Darco-HG, HOK, et cetera, close parenthesis; sorbent injection rate in pounds per million ACF

associated with that test point displayed; D, intrinsic mercury removal versus mercury removal with the sorbent; e, fuel type, PRB, bituminous, Lignite, if a blend, indicate percentages; F, sulfur content of the fuel in pounds per million BTU, open parenthesis, SO3, if measured, close parenthesis; G, carbon content of the fly ash; H, ESP temperature; I, air preheater type, open parenthesis, lungstrom or tubular. And at this point we would like to introduce that table.

MR. ZABEL: Could I have Mr. Cichanowicz describe briefly what this table is and then -- well, mark it as an exhibit first.

MR. AYRES: Prior to that Madam Chairman, this question has been out there now for sometime. We asked for the data so that we have time to see what it said. Now, we are receiving it when we don't have time to review it. So I think that at a minimum we have to be able to come back at this point later on after we

can see what they told us.

MR. ZABEL: That has been the pattern of the hearings throughout this proceeding. In June I believe the Agency was copying things during breaks and giving them to us. I don't recall the question asked for it in advance. And we only had a week to prepare answers, in any event, to the questions, which was much less time than the agency had for the June hearings.

MR. CICHANOWICZ: I will state for the record since I received the questions Monday night, I have done virtually nothing from Tuesday morning through Sunday night at 7:30 preparing and I am happy to do so. But I put every effort I could into getting the table out as quickly as I could. And the exhibit is my best effort as it stands.

I am happy to follow up, if need be. But this is as it stands at this point.

HEARING OFFICER TIPSORD: And I will allow follow up after you have had a

chance to review it.

We have not marked it as an exhibit. The discussion is over "Figure 5-2, Update Specifics and Source of Data." We will mark this as Exhibit 85. Hearing no objection, seeing none, it is Exhibit 85.

MR. ZABEL: Can you just briefly describe, Mr. Cichanowicz, what the exhibit is as it responds to question 17?

MR. CICHANOWICZ: The exhibit is a detailed delineation of the data that characterizes each point. I fulfilled all but a couple or three of the items to provide more detail on the source of the data.

HEARING OFFICER TIPSORD: Let me note for the record we will let you look at this perhaps after breaking at lunch and we can come back to that.

MR. ZABEL: I suspect we will not be done with Mr. Cichanowicz by lunch.

MR. AYRES: And we are not done with that table either.

HEARING OFFICER TIPSORD: We will go

back to that after lunch. But in the meantime, let's go ahead with question 18.

MR. CICHANOWICZ: Question 18, so that it is easy to follow, please provide the figure with an assigned number for each data point. Please also provide a table containing this information for each data point.

MR. ZABEL: We thought it might be easier as Mr. Cichanowicz describes what he did in response to this question to be able to look at it on a large blow-up. But we have given -- I would like marked as exhibits the smaller version of that.

HEARING OFFICER TIPSORD: Excellent. So we will mark "Original Figure 5-2" at the bottom, it is ESP SCA ft2/kacfm. And we will mark this as Exhibit 86 if there is no objection? Seeing none, it is Exhibit 86. And I will note for the record that this Exhibit 86 is identical to an oversized chart that Mr. Cichanowicz is using. And, therefore, we will not mark the oversized exhibit.

MR. ZABEL: That was our hope. We didn't think you wanted to put that into your record.

MR. CICHANOWICZ: I would like the opportunity -- I would like the opportunity to explain figure 5-2. First, the question, why did I do this. I was with most of you in Springfield, and you were -- you endured a lot of data, very well presented by Dr. Staudt. But still, after a week or two of a lot of data, I would imagine that -- I tried to take a page from the book a picture is worth a thousand words where I tried to take some of the key data points and depict them in a chart or a graph in somewhat of an anecdotal relationship, just to get a different view, say a 30,000-foot view of the data.

Whenever you do that, you gain some perspective from 30,000 feet, but you lose some resolution. I think we will be talking a little bit about how we lost some resolution, but I think there is a

value to doing this.

Second of all is that I didn't invent this depiction here now just for mercury. In my decades of experience, it is quite common to plot the result of a field test as a function of something about the power plant that is related to its size. In the late '70s when low NOx burners were first evolving, we used to plot the NOx emissions as a function of something called the boiler heat release rate. It was an imperfect comparison. But as we were getting our arms around the technology, it was good to see how the units performed as you changed the area available for heat release. That was very helpful in getting people started with low NOx burners.

Fifteen years ago, I published a couple papers with regard to selective catalytic reduction NOx control where we plotted the performance against something called space velocity, which is the volume of catalyst normalized by the flow rate.

The details aren't important, but the issue is. Again with full-scale commercial equipment, this can be a very insightful tool. It doesn't tell you everything, but it gives you an idea about the performance of equipment as the size of the thing that you are looking at changes. When I say size of the thing, I mean relative to the size of the gas volume being treated.

So I didn't just invent this now. This is in my book, having done this for a while, a fairly common technique to try to just get your arms around the data and sort of get a global overview of what it looks like.

So what the chart shows is on the vertical axis the mercury removal efficiency. And there is a lot of definitions of this and you have to be careful. But I tried my best to make them all comparable. The horizontal axis is the term called ESP specific collecting area. It is the relative size of the ESP

to refresh your memory. It is the amount of plate area that you pay for that will collect particles per gas flow that goes through it. It's not the only thing we worry about with ESPs. But it is an important key design.

What I did was I took the data available as of the second or third week of June -- I forgot where the end point was -- and essentially took that and plotted it as the best I could. I tried to pick comparable conditions. In most cases I picked the maximum mercury removal that I could find and I plotted that as a function of the SCA for the different test programs that are available.

What it shows is on -- and I made it very clear a couple of times in my testimony that this is not an apples-and-apples comparison. With full-scale power plants you can't do that. There is always other things changing.

Again, this is not an apples-to-apples comparison. There are

always other things changing, so you have to be careful. And some data points will have a less weight of evidence I believe is the word we use than others. And we can, essentially, assign a less weight of evidence. But we have to look at them first.

So what I have done here is plot the data. And what you are seeing is a flashing line for a number of data points that are around 90 percent removal from some of the larger ESPs.

The blue circles that are indicated, if you can see those, those were my understanding of what was a 30-day demonstration or performance test. I tried to delineate those. The other points are, essentially, the maximum or near maximum removals for short-term tests whose duration might have been just a couple or three hours.

So what you see is a locus of points that are around 90 percent, some of them certainly above it for large size

precipitators. As you move to the left, essentially, you see the points are at lower mercury removal and they all have numbers assigned to them.

And you have to look at each one of these points. And, indeed, they are all different. For example, I think point No. 12 is something called a TOXECON application, which is not really the same as a small ESP. And to some degree you would expect mercury removal to lower and it's lower a lignite fuel. But the point is it is a starting point for the discussion of the performance of the system.

So this is, essentially, the first depiction that I have put together to give an idea about how the data lays out. And when I looked at this, what struck me was, number one, a lot of the 90 percent and 95 percent removals, again under the limitation that they are short-term and 30 days, a lot of them are for large electrostatic precipitators. And there

are certainly no points in that area for the smaller ones that we think would be more characteristic of the existing units at Illinois.

I'm not saying those points won't be there in a year. But at this point they are not there now. So this is the first look at this.

MR. ZABEL: Do you want the next one?

HEARING OFFICER TIPSORD: Mr. Ayres?

MR. AYERS: I am sorry, are you finished with that chart?

MR. ZABEL: Yes, we are going to another one.

HEARING OFFICER TIPSORD: Do you have some specific questions?

MR. AYRES: Yes, I do have a follow-up question on that.

Mr. Cichanowicz, would you say that most of the plants to the right of your 400 line there are burning power river basin or other low sulfur coal?

MR. CICHANOWICZ: No. Most of them

are burning a low sulfur coal or a lignite. There is one or two power river basin points on there. And I actually --

MR. AYRES: But they are burning low sulfur coals on the whole?

MR. CICHANOWICZ: For example --

MR. AYRES: I mean the ones to the right-hand side, the ones with the high removals?

MR. CICHANOWICZ: The ones with the high removals I think are mostly PRB coals. We can go over each point. And that's -- that's why.

MR. AYRES: We want -- I think we want to come back to it, but I want to make one point here. Are the ones to the left of that line mostly bituminous coals, the ones that are showing lower reductions?

MR. CICHANOWICZ: It's a mixture. There is one, maybe two PRB coals on here now. And the rest are a mixture.

MR. AYRES: So for the most part, the ones to the left of the line are

higher sulfur bituminous; the ones to the right are lower sulfur coals, not necessarily PRB, but lower sulfur?

MR. CICHANOWICZ: Repeat that, please.

MR. AYRES: So it would be generally accurate to say that the units that are to the left of your 400 line are mostly units that are burning bituminous -- higher sulfur bituminous coal and the ones to the right of your 400 line are mostly units that are burning lower sulfur and/or power river, which is low sulfur?

MR. CICHANOWICZ: Generally, that is a correct statement. Yes.

MR. AYRES: So is it possible then that the differences that seek to be applied here could simply be an artifact of the fact that engineers design ESPs for low sulfur coals to be considerably larger than they do for higher sulfur coals?

MR. CICHANOWICZ: That is a possibility, yes.

MR. AYERS: Okay. Thank you.

HEARING OFFICER TIPSORD: Mr. Nelson, do you have a question?

MR. NELSON: Sid Nelson again. I am more concerned with the top and bottom. Of those that are above 90 percent or above, say, 87 percent, No. 3, Meramac; No. 10, Dave Johnson; No. 11, St. Clair; No. 13, Stanton 1, all those that are 90 percent or above, those are all PRB coals, are they not?

MR. CICHANOWICZ: Yes.

MR. NELSON: And the ones below the 90 percent, those are the ones that Illinois has very little bituminous coals, right? Those are the bituminous coal plants or lignite, a lot of these are lignite?

MR. CICHANOWICZ: Correct.

MR. NELSON: And in Illinois, is there any lignite burning in Illinois?

MR. CICHANOWICZ: Not that I know of.

MR. NELSON: With respect to the majority of the plants in Illinois, those

are the ones above 90 percent?

MR. CICHANOWICZ: Generally, the removals that are at 90 percent and above are PRB coals. And that is the predominant fuel fired in Illinois.

MR. NELSON: There is one you don't have a big circle on here called Stanton 1. You have I guess an X there that says high baseline. Is that X -- was there a high baseline at Stanton 1?

MR. CICHANOWICZ: No. Mr. Nelson, would you let me finish? I am saying I am going to answer your questions if I can get through another series of exhibits. And I would be happy to -- a lot of your questions will be answered in the next chart.

MR. NELSON: Okay. Thank you.

MR. AYRES: Madam chairman, I have one more question.

HEARING OFFICER TIPSORD: Go ahead, Mr. Ayers.

MR. AYRES: Mr. Cichanowicz, the X axis of this table is plotted in log

scale. The 400 looks like it is way over towards a 1,000.

MR. CICHANOWICZ: That is correct. And I am sorry I was remiss in not pointing that out in the beginning.

MR. AYRES: And if you plotted it in a normal scale, non-log scale, wouldn't that move many of the points on the left-hand side of 400 quite a bit to the left?

MR. CICHANOWICZ: No. The numbers are the numbers, Mr. Ayers. They aren't going to change.

MR. AYRES: But the position would change, the representation would change and it might give quite a different impression.

MR. CICHANOWICZ: Actually, I had it both ways. And in my opinion it didn't give an impression.

I used this because the logarithm method is to -- Dr. Staudt did a good job explaining this in Springfield. But engineers, you know, we are basically

lazy. And when we have a bunch of data that we don't know what to do with it, if you can crush it into a straight line, it is a lot easier to think about.

Mr. Nelson uses logarithmic plots in comparing his sorbent to other sorbents. And I think it is a fairly common technique. I used it here to compress the data a little bit.

MR. AYRES: I thought you were going to say you had log paper that day. I have heard that from engineers.

MR. CICHANOWICZ: In today's world with Excel spreadsheets, that should not be an acceptable answer.

HEARING OFFICER TIPSORD: I have been handed figure 5-2 with changes. And again Mr. Cichanowicz will be using an oversized exhibit for purposes of the hearing. But it is identical to what I have been handed. And, therefore, we won't admit the oversized exhibit into the record. If there is no objection --

MR. ZABEL: Do you want to do this

one?

MR. CICHANOWICZ: We don't need to do the second one.

MR. ZABEL: You can discard the one I handed out. To expedite, we will go to the next one.

HEARING OFFICER TIPSORD: We can keep it as an exhibit. Do you want to withdraw it completely?

MR. ZABEL: Yes. You are not going to refer to it, are you, Ed?

MR. CICHANOWICZ: No.

MR. ZABEL: Let's not even mark it as an exhibit.

HEARING OFFICER TIPSORD: I have been handed figure 5-2 and additional data. It is again identical to the oversize exhibit which Mr. Cichanowicz will be using for purposes of the hearing, so we won't admit the oversized exhibit. And if there is no objection, I will mark this as Exhibit 87. Seeing none, it is Exhibit 87.

MR. ZABEL: Thank you, Madam Hearing

Officer. Mr. Cichanowicz, would you describe what this is?

MR. CICHANOWICZ: This chart is a little bit different -- the first one was exactly as my testimony and it is still a valid point. There's a couple of differences. And I am sorry to confuse you.

But, basically, the first thing is I took off a couple data points because upon questioning from IEPA, I did understand I misread one slide for Monroe. So I took that data point off and I replaced it with another one. But it is right here. We can discuss it here. I was trying to work through it step by step.

The second thing I did was I went back and I looked again and put every possible piece of data that I could get from a demonstration test that had been cleared by the Department of Energy.

Now, at this point, before I go into this, I would like to divert a little bit. There was a question asked in Springfield

by Dr. Girard about the references. And the more I thought about it, the more significant it became. And as I have chased down a lot of detail in the last couple of months, I did want to bring it up. And that has to do with references in reporting.

The world of mercury removal right now is chaotic. And I mean that in a good sense. There's a lot of stuff going on. There is at least count six or seven conferences a year that are either devoted to mercury or have had major sessions at them. You can make a career out of going to them, some people do. And there is, I don't want to say, a breakdown. But the reporting can be somewhat dysfunctional in that you find a lot of early data gets introduced into the conferences. And then it takes a long time for the detailed reports to be issued by the Department of Energy after they have been thoroughly thought through and all the -- all the elements of the data can be put together.

And so there is somewhat of a disconnect between some of the data that you see in the conferences and the quarterly reports. If nothing else, it takes a lot more time for them to come out.

So what I did in this particular handout was I referenced all the reports that have been published and that have been approved by the Department of Energy. And there was one or two where I simply couldn't just find the reports. I'm not saying they weren't out, but I just couldn't find them.

Well, having had a chance to look again and see, you know, since I prepared this first version in the middle of June, a number of additional data points have been out. And this answers one of Mr. Nelson's questions I think.

HEARING OFFICER TIPSORD: Excuse me, Mr. Cichanowicz. Just for clarification, the key on what is Exhibit 86 is also the key for Exhibit 87, I am assuming? For

example, you have entry of carbon sorbent is the sort of --

MR. CICHANOWICZ: Yes, I took those off just to clean it up. Because there is two sets of data points. The purply looking boxes are the original data. The dark boxes are the new ones that have been added.

And as you can see, there is -- there are some additions. Most significantly at the top and above 90 percent is a word -- this is a particular sorbent from Alstom. And this is not on the website as of the middle of June, but it is there now. So it is 90 percent.

And No. 15 is Yates No. 6, which was not available to me at the time or I wasn't aware that they had done that test under those conditions.

And then the only other changes we are addressing are IEPA's question on Monroe. But I included a 30-day test from

Monroe, which is point No. 17.

And also it is less relevant. But I want to say just because I want to have everything on the chart. Point 18 is the Conesville, which actually is much less than 50 percent, but it is not really all that relevant as it is in the high sulfur bituminous coal. But I wanted to have everything on the chart.

MR. ZABEL: I believe it is 16.

HEARING OFFICER TIPSORD: I don't see an 18.

MR. CICHANOWICZ: 16, thank you.

MR. AYRES: May I interrupt, I'm sorry?

HEARING OFFICER TIPSORD: Yes.

MR. AYRES: Do we have or do you have a chart similar to the one you gave us earlier for this earlier exhibit which indicates the names and the information for each of those plants as well so we can see what's in this table?

MR. CICHANOWICZ: It's coming next. Keep reading. It is in the chart. They

are numbered sequentially. What I did was I tried to keep the same number for the same unit. So Meramac is unit two. I am not sure why it was unit two, but it was. So I retained that number. And you will see the long-term testing for Meramac on that page.

MR. AYRES: So there are a couple of new ones, but they are 15 and 16? Or are there additional new ones, new units, not tests?

MR. CICHANOWICZ: Point 16 is new, yes.

HEARING OFFICER TIPSORD: So for point of clarification, the numbers on the figure 5-2, which are Exhibits 86 and 87, correspond to the numbers in Exhibit 85, correct?

MR. CICHANOWICZ: Correct. Thank you.

HEARING OFFICER TIPSORD: I just wanted to clear that up for the record. Thank you.

MR. CICHANOWICZ: So again I think

the conclusion -- or again I look at this and I say, you know, we are evolving. There is a lot of demonstration work going on. But I look at the point of 300 SCA, which according to the information I have from the energy information agency and any updates that I have done, 80 percent of the existing ESPs in Illinois are of a size such that they are less than 300 SCA. And there is not at this point a locus of data points, and particularly of interest of PRB whole that are at the 90 percent or above the 90 percent line. There might be in the future, but at this point there is not.

HEARING OFFICER TIPSORD: Okay. Mr. Nelson?

MR. NELSON: Again, Sid Nelson. Are you aware of the early data on the Crawford Station here in Chicago?

MR. CICHANOWICZ: Okay. I would like to revoke my discussion where I referenced Dr. Girard and my comment to Dr. Girard. There seems to be different

levels of -- I don't know what the word is -- criteria in lending data out. And I'm finding that informal reports from field tests related to the results in a technical paper related to what comes out in a quarterly report, sometimes it is not always the same. Maybe the numbers are the same, but it turns out there is qualifications.

So having that as a background, my answer to you is I am not aware of the data because I would rather have people think about it and make sure they understand the implications before, you know, we jump to any conclusions.

MR. NELSON: Okay. Are you aware of the early data that DOE has approved for release of the Crawford Station?

MR. CICHANOWICZ: I am not aware of early data that DOE has approved for release.

MR. NELSON: What is the SCA of the Crawford of the ESPs here in Chicago?

MR. CICHANOWICZ: I might have that

on a chart that is coming up in a little while. But I can't pull it off the top of my head.

MR. NELSON: Do you think it might be an SCA of 118 square feet per 1,000 ACF?

MR. CICHANOWICZ: We will find that in a few minutes, Mr. Nelson.

MR. NELSON: If it was 118, would that make it the smallest or along with Fisk at 115, one of the two smallest ESPs in Illinois?

MR. CICHANOWICZ: Or perhaps the United States of America, yes.

MR. NELSON: Where would 118 be on your graph there?

MR. CICHANOWICZ: Pretty close to the number 100 that is all the way over the right.

MR. NELSON: All the way to the right.

MR. CICHANOWICZ: All the way to the left.

MR. NELSON: For my questioning I

would like to enter as an exhibit for the Board the early data from Crawford at 118, if I may. I will ask you questions on this and you can respond later.

HEARING OFFICER TIPSORD: Do you have a couple more copies? Make sure they get one too.

MR. CICHANOWICZ: I do want to make note that I am used to having the DOE reports released with the project manager.

HEARING OFFICER TIPSORD: If there is no objection, we will mark this for purposes of the record Exhibit 88. It is "Mercury Removal at Midwest Generation's Crawford Unit 7 in Chicago." Seeing none, it is Exhibit 88.

MR. NELSON: Now, I realize you are going to have to look through this. But to quickly walk you through, could you describe how short-term parametric tests are conducted in these DOE trials?

MR. CICHANOWICZ: You are asking me to describe what?

MR. NELSON: How a short-term

parametric test -- these DOE tests usually -- do they usually have a baseline period first where they simply are not injecting sorbent but they look at the background mercury performance of the unit?

MR. CICHANOWICZ: Yes. In any field test program, no matter what you measure, you need to make sure you characterize the baseline first.

MR. NELSON: Before they do a long-term continuous 30-day test, is it usually the procedure in these DOE tests that they do for a couple weeks parametric tests where they test a couple different sorbents at a couple different injection rates, for example, to determine what injection rate sorbent to use in the continuous 30-day tests?

MR. CICHANOWICZ: 30-day tests are usually preceded by a sorbent parametric test, that's correct.

MR. NELSON: In looking at the first page here where it looks like this is time and hours on the X axis and then the

mercury level from the continuous emission monitors or the method 322 analyses on the Y axis -- I realize you haven't seen this before. But if -- could you walk the Board through what I describe might explain if these are the two CEMS plots.

HEARING OFFICER TIPSORD: For purposes of the record that is CEMS, correct?

MR. NELSON: Yes, CEMS.

HEARING OFFICER TIPSORD: And it stands for?

MR. NELSON: Continuous emission module, mercury continuous emission module.

HEARING OFFICER TIPSORD: Yes, Mr. Bonebrake?

MR. BONEBRAKE: Madam Hearing Officer, there hasn't been any foundation laid for this document. And it would perhaps at least be helpful for Mr. Nelson to describe what this document purports to be, where it came from, what the source of the information is.

HEARING OFFICER TIPSORD: I am going to have you sworn in to do that.

(Witness duly sworn.)

HEARING OFFICER TIPSORD: Then if you could explain what this document is and where you received it from.

MR. NELSON: These are plots of data from the people running the mercury CEMS at the Crawford Station. This is the one with the very small ESP here in Chicago.

There was four days of parametric testing prior to the beginning of the 30-day run, which will begin tomorrow at the station, a continuous run.

And what this is is different injection rates. For example, this first day on August 5th, you can see that this -- from 12:00 o'clock to 2:00 o'clock, nothing had been injected up until this point. And then the sorbent was turned on at one pound per million ACF, which is a very low level.

Now, the sorbent being used at Crawford is called C-PAC. It is not the

standard bromine sorbent. This is a concrete friendly bromine sorbent. Similar to the fact that it has the added advantage that the expectation is that this fly ash will continue to be sold for concrete use.

And as you can see, when the sorbent was first turned on at that low level of one pound, the mercury level immediately dropped. Now, the difference between the blue line and the pink line before that is the difference in the outlet -- well, the blue line is a continuous emission monitor measuring mercury right before the injection point. And then the pink is after the ESP on the outlet.

So the plant already gets some native removal on its own because of the unburnt fly ash. If you calculate the mercury based on the coal inlet and assume a hundred percent of it goes through the vapor phase by mass balance, that top blue line is around 14 micrograms or 14,000 nanograms is basically output. All the

mercury went up the stack. That's the concentration that you would expect.

The drop at one pound there -- and it continues to drop for a while -- is the difference that the sorbent has made. And then when it is increased to, for example, three pounds per million ACF, you see it drops further because the more sorbent you inject, the more mercury removal you get.

HEARING OFFICER TIPSORD: Excuse me, Mr. Nelson, is this information -- I see at the top here it says preliminary concrete friendly C-PAC data from DOE. Is this the information you were referring to earlier that has been approved for release from the Department of Energy?

MR. NELSON: No. That is the project number, the contract number for DOE. This is just the early parametric data. And I don't want to go into it in too much detail. But the Board can look at it.

There were only four days of data. A good one --

HEARING OFFICER TIPSORD: Excuse me, Mr. Nelson. I would prefer that you not explain in detail what this is because you are here to ask questions, not testify.

MR. NELSON: Sure.

HEARING OFFICER TIPSORD: I believe the question was where did it come from. Your answer was people performing the test. Could you tell us who that is?

MR. NELSON: The people doing the analysis -- the actual measurements is Western Kentucky University. The analysis of putting this graph together is myself in taking their data and putting it in a form to be presented here.

MR. ZABEL: I think you asked the question, Madam Hearing Officer, has this been released for public use by the Department of Energy, Mr. Nelson?

MR. NELSON: Yes. I got their approval to release the data that you see here.

MR. ZABEL: You got personal approval. Has it been released for public

dissemination other than to you?
MR. NELSON: It has been released for public for this hearing, yes.
MR. ZABEL: Are you aware that Midwest Generation has never seen this data and it's their plant?
MR. NELSON: Midwest Generation has seen this data, of course.
MR. ZABEL: I can call a Midwest Generation witness to say they haven't seen it, Mr. Nelson, if you want me to.
MR. NELSON: You can. I would be surprised -- Ken Wanninger is the Midwest Generation project manager, and he has seen this data.
MR. ZABEL: Has he seen the data points or this presentation ever?
MR. NELSON: He has seen this presentation of it.
MR. CICHANOWICZ: Just to clarify, Mr. Nelson, you did talk to Lynn Brickett about this?
MR. NELSON: Yes.
MR. CICHANOWICZ: And so she is

comfortable with you presenting this today?

MR. NELSON: Yes. I don't want to spend too much time on it. But this is the first small ESP that has been tested. I would like to -- if you look at the third page, this is a different kind of plot. There will be future questions about opacity and issues of have we increased particulate emissions with adding this one or two percent of carbon to the fly ash load. I know we will get to this on Lee later.

But this is the early data from Crawford, which has the small ESP. If I may simply testify to what the axes are and how to interpret the graph. On the --

HEARING OFFICER TIPSORD: Actually, Mr. Nelson, I don't think I am comfortable with that. I will tell you that you are free to submit final comments on anything. But I am not sure, given the obvious concern with the counsel for Midwest Generation, that we should have you

testifying -- I mean, obviously, we know what the axes are and the document speaks for itself. But if you have additional questions?

MR. AYRES: This page 3 relates to the opacity issue which comes up later in our questioning as well. Wouldn't it be more appropriate to talk about this in that context?

HEARING OFFICER TIPSORD: We can revisit that then. Mr. Bonebrake?

MR. BONEBRAKE: I would put an objection on the record as well to Mr. Nelson both testifying and asking questions at the same time. At the very least, that is creating a great deal of confusion.

HEARING OFFICER TIPSORD: I understand that. But I have to tell you from personal experiences in a hearing, I do my very, very best to make sure they are questions and not testimony. But I have been known to swear in most of the audience. So I will do my very best. And

I appreciate your concern.

MR. AYRES: Can Mr. Nelson's questions about this chart be answered?

HEARING OFFICER TIPSORD: Yes, absolutely. I prefer he not continue to explain what the material means but to ask questions.

MR. NELSON: I will reserve my questions on the opacity issue to when we get to the opacity issue.

I will ask one more question, though, on the second page of the bar chart. Is it common to measure mercury in multiple ways simultaneously so that you make sure you get good numbers?

MR. CICHANOWICZ: Yes.

MR. NELSON: Are you familiar with the method 324 appendix K, the method that EPRI developed?

MR. CICHANOWICZ: Generally.

MR. NELSON: Would you consider that to be a good method of measuring mercury?

MR. CICHANOWICZ: Yes.

MR. NELSON: Is it proposed as an

acceptable method, in addition to CEMS in the federal regulation?

MR. CICHANOWICZ: I believe it is.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: Can I ask a question of the questioner?

HEARING OFFICER TIPSORD: Well, considering that Mr. Bonebrake just asked me not to let him testify --

MS. BASSI: I want to clarify his question.

HEARING OFFICER TIPSORD: That's fine. Yes. I am teasing.

MS. BASSI: Did you say that this method 324 is proposed somewhere; it is not an adopted approved method?

MR. NELSON: No. Actually, a version of 324 called appendix K, which is slightly different, is an acceptable method in the EPA utility mercury world.

My question to Mr. Cichanowicz, if multiple method 324s show 90 percent mercury removal from coal to stack, would you say that there would be reasonable

legitimacy in those kind of numbers?

MR. CICHANOWICZ: There would be reasonable legitimacy as to what they address. That is the short-term data without time to sort out balance and planning max. But I don't doubt that those, as long as the sampling had been done properly, are reasonable.

MR. NELSON: Will you feel much more comfortable with the data after there is a 30-day continuous test?

MR. CICHANOWICZ: I would feel more comfortable with the data after there is a 30-day continuous test. I will not feel much more comfortable with a lot of this data until there is tests approaching the unit.

MR. NELSON: As long as this is on the record, I have no further questions.

HEARING OFFICER TIPSORD: Great. Mr. Harley, did you have something additional?

MR. HARLEY: No.

MR. CICHANOWICZ: If there is any

doubt about what I said earlier about mercury reporting being chaotic, I think this shows it is. We are even preceding the conferences now. I have forgotten where I am.

MR. AYRES: You did say it was rapidly evolving.

MR. CICHANOWICZ: I didn't mean this morning.

MR. AYRES: It is in real time now. I think we were on question 19, unless you were done.

MR. CICHANOWICZ: I am done. What I would like to do is look at something a little bit different.

Again I plotted this out. And I made it clear in my testimony this wasn't a theory; it was just anecdotal. There was perhaps something about large SCA ESPs that make it amenable to high levels of mercury removal. Perhaps maybe it didn't go with the ESP SCA but something else that went with it.

What I would like to do now is show

some images that might give us an idea of how these different installations are.

MR. ZABEL: There is some overlap with the questions, but this goes to the SCA question. We thought it was appropriate here. The answers to questions overlap. Again we have smaller versions for the record.

HEARING OFFICER TIPSORD: Thank you.

MR. ZABEL: I should point out there was an issue raised concerning Homeland Security regulations and certain kinds of infrastructure facilities. These are all taken from the publicly available documents. Although Homeland Security addresses even publicly available documents, we don't think we are crossing that line by introducing it.

Although, I have to say from a lawyer's point of view, those regulations are a little bit confusing.

HEARING OFFICER TIPSORD: I have been handed an image that has at the top right St. Clair 1 through 4 ORG, period,

SCA. And I will mark this as Exhibit 89, if there is no objection. Seeing none, it is Exhibit 89. And on the same vein this is identical to the oversize one, we will not admit the oversize into the record.

MR. ZABEL: Mr. Cichanowicz, can you describe it?

MR. CICHANOWICZ: Well, first, it is almost scary what you can do at home with a browser and a fast Internet connection.

What we have done is pulled down some satellite images from Google of some of these plants. And I am doing it just again to give you a visual on the kinds of things that we are talking about.

Mr. Ayers will probably ask me why didn't I do all the units in Illinois. The reality is I didn't think of this until about a couple or three weeks ago. And it took me that long to get this far. If I thought about it two to three months ago, you would have about a hundred images on your desk. So it just didn't occur to me a couple, three weeks ago.

What I am going to do is show a number of images of some of the units that have been rebuilt and then also images of those many units in Illinois that have not been rebuilt, one of them in Will County and the unit that Mr. Nelson owns.

This is Detroit Edison St. Clair. What you are looking at is a satellite image looking down on the plant. To the right is the lake. The red boxes are an outline over the enlarged ESPs that were retrofitted in the mid '80s.

MR. AYRES: Mr. Cichanowicz, can you tell us which data point number St. Clair is on your chart?

MR. CICHANOWICZ: It's listed as 11.

MR. AYRES: Thank you.

MR. CICHANOWICZ: So the red boxes are the new outlines of the ESPs. And their new SCAs are 700. And the yellow boxes are the outlines of the old original ESPs, and their SCAs are about 150. Moving further to the left is a dark gray rectangular box. You are looking down on

the top of the boiler building.

Gases leave the boiler in this boiler building that I have just identified and proceed to the right. They used to go through -- the four units here, they used to go through the little yellow boxes and into the sack. If you look closely, you can see some dark outlines of what the sold stacks used to be directly to the right of these yellow boxes. Those stacks have been removed. The dark outlines are just what's remaining.

The gas is -- with the yellow box now gone, the gas goes to the red box. And that is, essentially, the new ESP. And I just want you to get an idea what the new ESP size was compared to the old.

Because this was such a major retrofit, the old stacks could not be used. And if you look near the bottom, just to the left of the legend down there, you see a light stack with four orifices coming out of the top. And the flue gas proceeds from all of these units the left

to right into a common clean plenum and proceeds down to the stack.

This modification from my understanding was done to allow St. Clair to fire PRB coal or a mixture of PRB coal. And Bill Rogers, one of the leaders of the environmental group, said they purposely offered St. Clair for the demonstration because they wanted it to succeed.

But I wanted to point out that this is not a typical ESP installation. And again this is Detroit Edison in St. Clair.

Now, I would like to show another one.

HEARING OFFICER TIPSORD: I have been handed Meramac 2. And if there is no objection, we will admit this as Exhibit 90. Mr. Nelson, do you have an objection or a question?

MR. NELSON: Just a quick question.

HEARING OFFICER TIPSORD: Okay. Let me finish with the exhibit and then you can ask the question. Seeing no objections, this one is marked as

Exhibit 90.

Mr. Nelson, go ahead and ask your question.

MR. NELSON: Sid Nelson. Before we move on to Meramac, at St. Clair during the 30-day trial that got the 93 percent mercury removal, how many of the six fields of that 717 SCA were actually injected?

MR. CICHANOWICZ: My understanding is that one of the fields was de-energized. And in reading the report over the weekend, which I believe you authored, the statement there was still some particulate removal in the de-energized field because the particles retained a charge from the first field.

MR. NELSON: Did the report say that actually two of the four fields were not energized, the first and third, and though the third was referenced because some particles were energized in the second field so that only two-thirds of that SCA were effectively used?

MR. CICHANOWICZ: My recollection is that it was one-third. But you authored the report. So we can -- while I have St. Clair back up, I do want to point out that the sorbent was injected, according to my understanding, at about the beginning of this particular yellow box. And my whole point on this is that in addition to just a larger SCA, when people rebuild these ESPs, you almost by definition have to have some type of extended inlet ductwork. It just goes with the territory. It is sort of hard to build the enlarged box without, in most cases, having some additional ductwork to get it there. And that will become evident too.

Next is Ameren, Meramac. In the upper right-hand corner, the new SCA is 400. The original 150. If you look at the red box, that is the outline a little of the new ESP. As you move to the left, you see the stack. And as you continue to move to the left, you see the yellow box, which is our best estimate after

discussions with Ameren about where the original ESP was. And as you continue to move to the left, you see the top of the bar graphs.

The situation is the same. The flue gas leaves the boiler house. It goes from left to right. Initially, it went to the yellow box for collection into these series of stacks that are directly to the right of the ESP. The new ESP was added behind the stacks. And that, essentially, required the inlet ductwork to go through the remains or the new located old ESP all the way out to the right and then it dropped down and came back to the left of the stacks.

So there was a very large extended ductwork on here. I think the sorbent injection was about in the middle of this ductwork on the way because the gas was proceeding to the left and right.

Again, I point this out as to compare the new ESPs to the original ESPs and the length of the ductwork that was

available prior to -- prior to moving to the new ESP.

MR. AYRES: Looking at that -- just a question of clarification. Looking at the legend up to the right-hand side there, is it correct to read that to say the original SCA, the yellow outlined ESP, was about 150 and the new one is 400 or that the combination of the two, with the addition of the new one, equals 400?

MR. CICHANOWICZ: Meramac completely removed the original SCA. Now, there is a discrepancy -- I thought that was what you were going to ask me. There is a discrepancy in between the SCAs as reported by the testing firm ADA and Ameren. And these numbers I was given by Mr. Steve Woodworth in Springfield. And they are consistent with what's in the EIA database. I don't know why the testing firm used a different number.

MR. ZABEL: For the record Mr. Woodworth I believe works for Ameren; is that correct?

MR. CICHANOWICZ: Yes.

HEARING OFFICER TIPSORD: This says Duke Power Allen 1. And if there is no objection, this will be Exhibit 91. Seeing none, it is Exhibit 91.

MR. CICHANOWICZ: This is Duke Powers Allen Station Units 1 through 4. Near the bottom of the chart are the four stacks. Proceeding directly above them are the rebuilt ESPs. And you can see all the way to the left the red box is the outline of the new ESP and the small yellow box within it is the outline of the old ESP.

In this case the owner chose not to build behind the stack. And I don't know why. They were able to fit a fairly large ESP within the confines of the boiler house building and the stack. And they chose that as a method of upgrading the ESPs. And this was done to enable them to burn lower sulfur compliance coal.

The point is these ESPs were operating and do not reflect the original

design of the Allen Station.

MR. AYRES: Do you recall, Mr. Cichanowicz, what number on your -- on this chart, Exhibit 87, this plant is represented by?

MR. CICHANOWICZ: I believe six. In the chart that I gave out, the left-most column should be the number in it that corresponds.

MR. AYRES: Okay. Thank you.

MR. CICHANOWICZ: I must caution you, this exhibit may make you dizzy.

HEARING OFFICER TIPSORD: This is Salem Harbor 1. And if there is no objection, it will be Exhibit 92. Seeing none, it is Exhibit 92.

MR. CICHANOWICZ: This might be the power plant that is closest to Dr. Staudt's house. In fact, there is a boat in the water.

This is Salem Harbor, one of the early demonstrations on low sulfur bituminous coal. And again I point this out just to give you an idea of the type

of modifications that equal the new to upgraded ESP.

What we are seeing on the left is the body of water. You can see the stack horizontally across the top. Salem Harbor has four units. The demonstration was done on unit one, which is the top of the building. You can see the ESPs with the red boxes. The red box is the new ESP. And if you -- it treats gas from one to three units. And you can see the ductwork. If you trace that back to the yellow box, you can see where the old ESP used to be and, essentially, the older stacks. And the boiler house is directly to the left of the yellow box.

Here gas leaves the boiler house, used to go through the yellow box to the stack. And now it diverts to almost a -- to the side of the plant where new ESPs were installed. On the upper left-hand corner, I am indicating that the new SCA is about 474. The original runs about 150.

HEARING OFFICER TIPSORD: I'm sorry, Mr. Nelson?

MR. NELSON: Sid Nelson. At Salem Harbor, did they get 90 percent mercury removal without even injecting sorbent?

MR. CICHANOWICZ: Salem Harbor is somewhat of an aberration, in that they did get very high removals. And one has to wonder why the tests were done there. I think it was just -- I don't know.

But Salem Harbor in a context of everything else that we have been learning I think has diminished significance. But in my attempt to put every virtual data point I could on a chart and my attempt to connote to the Board the kinds of things that people have done to upgrade ESPs, I elected to keep Salem Harbor in the mix.

MR. NELSON: So it is relevant because there may be Illinois plants get very high removal as well.

MR. CICHANOWICZ: It is relevant because these are the kinds of modifications that people have made to

ESPs to improve ESP performance.

HEARING OFFICER TIPSORD: I have Pleasant Prairie now before me. And if there is no objection, I will mark this as Exhibit No. 93. Seeing none, it is Exhibit 93.

MR. AYRES: Sorry, but could you tell us which data point represents Pleasant Prairie.

MR. CICHANOWICZ: Number 8.

MR. AYERS: Thank you.

MR. CICHANOWICZ: Now, I show Pleasant Prairie because there were no modifications. It was the original design. The unit was oversized because they thought they were going to use a hot-side ESP but changed their mind in the mid '80s -- or early '80s.

But I want to point out a couple of things. Number one, this plant being located in a rural area is not nearly a site constrained as some of the images we are going to go to next. Even though it has a large ESP, you can see the red boxes

in the middle. There is plenty of space on the site.

This is a large plant, about 600 megawatts and in a rural area. You can lay out plants differently than when you are trying to do it in an urban area. I have to confess, I also included this because if you look above the yellow box, there is a red crane. And the red crane is there apparently because at the time this image was taken, the owner was retrofitting selective catalytic reduction NOx control, which is --

HEARING OFFICER TIPSORD: Could you point out the yellow box again?

MR. CICHANOWICZ: I am sorry, did I say yellow box? I should have said red box. There is no yellow box because this was an original design from scratch. I'm sorry.

But the point is, directly above the red box is a crane to install the catalytic reduction NOx system. This was apparently under construction at the time.

But I show this to contrast a series we are going to go through next about on-site constraints.

MR. AYRES: Madam Hearing Officer?

HEARING OFFICER TIPSORD: Yes.

MR. AYRES: I think we are prepared to stipulate that when you change ESPs, it's a big project. I'm not sure what the relevance of these images are beyond that.

MR. ZABEL: The relevance goes to the issue of site constraint, which is the next thing he is going to address. And it is the contrast with, for instance, the one that you just saw, which was Pleasant Prairie.

HEARING OFFICER TIPSORD: We will give them a little more leeway.

MR. ZABEL: Besides which, you wanted me to get to a hundred exhibits, Mr. Ayres.

MR. AYRES: I like looking at these pictures too; but I am not sure how it really helps.

MR. CICHANOWICZ: Waukegan.

HEARING OFFICER TIPSORD: This is Waukegan 6, 7 and 8. If there is no objection, we will mark this as Exhibit 94. Seeing none, we will mark this as Exhibit 94.

MR. HARLEY: Madam Hearing Officer, a point of clarification on this exhibit --

HEARING OFFICER TIPSORD: Excuse me, Mr. Harley, please identify yourself for the court reporter.

MR. HARLEY: Keith Harley, attorney for Environment Illinois and Illinois Public Industry Research Group. This exhibit is Waukegan 6, 7 and 8. Could you just clarify, is this the entire campus on which the electric generating unit is based or is this some portion of the campus on which Waukegan 6, 7 and 8 are operating?

MR. CICHANOWICZ: I actually don't know. I didn't pull the image down. There could be other units to the left or right. I don't know.

MR. HARLEY: There could be additional land mass as well associated with the total campus of the facility besides what you depicted here?

MR. CICHANOWICZ: There could be.

MR. HARLEY: Thank you.

MR. CICHANOWICZ: I will do a few more images.

HEARING OFFICER TIPSORD: That's okay.

MR. CICHANOWICZ: This is Waukegan. You can see it is Waukegan units 6, 7 and 8. You can see there is a waterway that constrains the units.

Unit eight in the lower left-hand corner, again you are looking down, the yellow box is the ESP that looks like it is 220 SCA. And that completely occupies the space from the boiler out to the stack. Unit 7 has an SCA of 386. And I could only conclude that this unit had already been upgraded because this is a relatively large ESP for a unit of this vintage. So you can see they filled out,

essentially, the land mass out to about the stack.

And then units -- unit 6 here has the best you can tell the usual feature of having the ESP being located on the roof, which will probably constrain any particular modifications.

HEARING OFFICER TIPSORD: Mr. Nelson?

MR. NELSON: Question -- excuse me, Sid Nelson. You say that having an ESP on the roof is unusual. What is the basis -- given the many that are out there, what is the basis for that conclusion?

MR. CICHANOWICZ: The many, Mr. Nelson, I stopped counting the power plants I visited at a hundred. And the ones that have ESPs on the roof are a very small fraction of that.

MR. NELSON: But they can be constructed on a roof under site constraint, can they not?

MR. CICHANOWICZ: I am trying think of the unit that -- yes, they can be and they are. Vintage units have been -- the

only ones I have seen with ESPs on the roof were built in the late '50s, early '60s, mid of '60s.

MR. NELSON: Are you aware of any ESPs that are built over highways, for example?

MR. CICHANOWICZ: I believe there is one in your home state of Ohio.

MR. NELSON: And, finally, again, what is the point of ESPs when we are talking about mercury?

MR. CICHANOWICZ: Because the point of sorbent injection is to contact the sorbent quickly, mix it well and provide adequate residence time to pick up the mercury removal that we think we need. And I am trying to connote that there is certainly some extreme differences in ESP size and inlet ductwork that characterize both the demonstration population as well as the risk population in Illinois.

And it is very difficult to take data from one set of conditions and apply it to another. And, indeed, these small

ESPs with the site constrained layouts and what I think are short inlet duct times are the subject of this latter phase of DOE funding that is actually demonstrated in your technology.

MR. NELSON: Aren't all these demonstrations concerned with injection into ductwork in plenums? And if the vast bulk of the particulate comes out in the first field, who cares how big the ESP is? Shouldn't you be showing photographs of duct runs and plenums instead of these boxes?

MR. CICHANOWICZ: I believe I did in the early photographs. I believe I pointed you had the injection locations. And, you know -- in -- Dr. Staudt about three quarters of the way through his testimony in Springfield cited Meramac and having a long duct run. It is not a secret.

So I am trying to contrast the conditions for these things. Many are demonstration units under the old ESPs

versus the new ones.

MR. MATOESIAN: What data point is this?

MR. CICHANOWICZ: There is not a data point. This is a mean for which there is no data yet.

Because Mr. Nelson has joined us today, we will put this in.

HEARING OFFICER TIPSORD: If there is no objection, we will mark this as Exhibit 95. It is Will County 1 through 4. Seeing none, we will mark this as Exhibit 95. Mr. Harley?

MR. HARLEY: Madam Hearing Officer, I would again ask is this, in fact, the entire campus on which the Will County facility is located or is this only a portion of the campus on which the Will County facility is located?

MR. CICHANOWICZ: I don't know.

MR. AYRES: Did you say which data point this was?

MR. HARLEY: Madam Hearing Officer --

HEARING OFFICER TIPSORD: Hold on. Mr. Ayers has a question.

MR. CICHANOWICZ: Again, this is a unit that has yet to see sorbent. So it is not a data point yet.

HEARING OFFICER TIPSORD: Now, Mr. Harley?

MR. HARLEY: Madam Hearing Officer, I would object in retrospect to the entry of Exhibit 94 and 95 as depictions of Will County 1 through 4 as well as depictions of the Waukegan facilities. This expert is testifying or is prepared to testify that these are land constrained facilities that may not have the same capacity as similarly situated facilities elsewhere in the country to do retrofits of electrostatic precipitators.

But we don't know what the total campus area is or what the actual layout is of either of these facilities based on these photographs.

Just for the record, your Honor, I do object to the entry of these exhibits.

HEARING OFFICER TIPSORD: I am going to overrule your objection. Mr. Zabel, you are welcome to respond.

MR. ZABEL: I have been told by judges it is time to stop arguing when I have been ruled in favor. I don't think I need to, Madam Hearing Officer.

HEARING OFFICER TIPSORD: I am going to overrule because I think you have brought out by a lot of your questions that these may not be the whole picture. And I think that's sufficient for purposes of the record.

MR. ZABEL: Then I will respond to just one aspect. It is not merely land constraint as the necessity of building extensive ductwork to where you can put a precipitator at a given site. There are two issues, not just land constraint. Mr. Harley has, I think, mischaracterized the issue.

MR. HARLEY: Madam Hearing Officer, in that case, then I would object to the fact that there is nothing in these

photographs that have been presented that provide an adequate level of detail so that we know what existing ductwork is at these facilities, the physical characteristics of the ductwork, opportunities to retrofit ductwork, ductwork at these facilities by comparison to the ones we have seen before. Again I object.

MS. BASSI: Madam Hearing Officer?

HEARING OFFICER TIPSORD: Ms. Bassi, I am not going to let you guys team up. You can talk to Mr. Zabel and discuss it. But he is responding to the objection. If you have another point you want to make --

MS. BASSI: I have another point.

HEARING OFFICER TIPSORD: Go ahead.

MS. BASSI: In the Board's record there is that information in the control configuration inspection report. And I don't know what the exhibit number is.

HEARING OFFICER TIPSORD: That came in as a post-hearing comment from the Agency, I believe.

MS. BASSI: No. It was introduced -- wasn't it introduced --

HEARING OFFICER TIPSORD: It came in as a post-hearing comment as part of the confidential information. So it came in the post-hearing comment and it is being held confidential, parts of it, in the clerk's office. Thank you, Mr. Bassi.

Given that, I am going to overrule your objection. Mr. Harley, you are, of course, free to raise this again or make any additional comments. Thank you.

MR. CICHANOWICZ: The last one and thank you for indulging me. This is Will County. And again we see the four units. At the bottom is water. Unit No. 4, again the yellow boxes are the existing ESPs, 213 SCA. Above the box is the boiler house. Below is the stack. Unit 3, similarly, the yellow box has an SCA of 233. Above it is the boiler house and below it is the stack. And you can see there was limited space around this area.

Units 1 and 2 actually have

relatively large ESPs, 323 and 351, large compared to units 3 and 4. And you can see their location with the yellow box.

HEARING OFFICER TIPSORD: Mr. Ayers, do you have a question?

MR. AYRES: Yes. Mr. Cichanowicz, you have given us a number of exhibits here, which I take from Mr. Zabel's comments and not yours, are intended to suggest that there are considerable constraints on increasing the size of SCRs at these pictured plants.

MR. CICHANOWICZ: SCAs you mean.

MR. AYRES: Yes, ESPs.

MR. CICHANOWICZ: Well. I think so. But like anything else, you can -- I'm -- I asked the people at Detroit Edison what they spent to upgrade St. Clair. And they -- anybody who had been associated with the project had retired or been laid off and downsizing. And they didn't know. They assured me it was a very high number. They wouldn't give me a number.

My point is you can add an ESP if

you are indifferent to what the cost is. You can always upgrade these facilities.

What Mr. Nelson was getting at was some facilities in Ohio where they have actually in a site constraint situation with a major thoroughfare built ductwork over the thoroughfare and, essentially, have that built and the like on the other side of the highway. That can be done.

MR. AYRES: In fact, isn't it pretty commonly done when companies decide to burn western coal as to when they have previously burned eastern coal?

MR. CICHANOWICZ: In fact, that is much of the motivation for the modification I have shown. It can be done.

But the point is you are making it a different game then. It is not two or three or $4 a kilowatt and it is probably not even 35. It is probably a lot more.

MR. AYRES: Isn't it also true, though, that if there is no need to increase the SCA of the ESP in order to

control mercury, that these constraints are really not an issue?

MR. CICHANOWICZ: Unless the sorbent reduces an opacity or particulate matter in the removal, then you need to do something. And there are some things you can do without expanding SCA. But we don't know to what extent they will -- they would work.

MR. AYRES: Well, we want to come back to this issue later and sort of as it flows in your testimony. So I will pass on that at this point.

HEARING OFFICER TIPSORD: Dr. Girard?

MR. GIRARD: Mr. Cichanowicz, so basically the issue here that you used all these different exhibits to illustrate is that site specific factors effect the cost of mercury removal at each plant?

MR. CICHANOWICZ: Yes, sir. I believe that's the case.

MR. GIRARD: Thank you.

MR. ZABEL: If I may follow up, the early ones, Mr. Cichanowicz, were

indicative of the size of the precipitators and some of the mercury tests, were they not?

MR. CICHANOWICZ: Yes. The demonstration tests were conducted on the ESPs that we described that were explained as new SCA.

MR. AYRES: Point of clarification to your earlier answer, your testimony certainly related to a lot of site specific factors. But again those are relevant to the extent it is necessary to make changes in existing ESPs in order to achieve mercury limits, correct?

MR. CICHANOWICZ: Yes.

MR. AYERS: Thank you.

HEARING OFFICER TIPSORD: Mr. Nelson?

MR. NELSON: If sorbent is injected at five pounds per million ACF or three pounds back at St. Clair and Meramac and Stanton 1, how much increased material is going to the ESP? How much more volume material does the ESP have to collect relative to the existing fly ash that

collects today day-to-day?

MR. CICHANOWICZ: What is the relative amount of mass?

MR. NELSON: Yes. What is the relative amount of mass that you are adding to the load of existing ESP at an injection rate of three to five pound per million of cubic feet of gas?

MR. CICHANOWICZ: Well, its a small amount, but it is only half the issue.

MR. NELSON: Is the amount, in fact, about one or two percent that you are increasing the particulate load to the ESP?

MR. CICHANOWICZ: It is a small amount. But that is only half of the issue.

MR. NELSON: So you are adding about one to two percent on average per load. If the ash content of the coal that they burn day-to-day varies from six to seven to eight to six to seven to eight percent of the coal, the ash level in the coal, if it varies, say, between six and eight over

the course of a day, how much difference in particulate load and weight percent does that -- does the particulate load vary to the ESP?

MR. CICHANOWICZ: Well, if your point is that variations in ash content are greater than sorbent, that's a true statement. But that's only half the story. The other half of the story --

MR. NELSON: Please answer my question. If you --

HEARING OFFICER TIPSORD: Excuse me. Time out.

MR. ZABEL: I am going to object because he is testifying to facts in his questions that are not of record.

HEARING OFFICER TIPSORD: He did ask a question and the question was answered. And his answer was he has agreed with your statement and has repeatedly stated it is only half the problem.

Now, you can ask another question. But please don't repeat the same question because he has answered the question.

MR. NELSON: If the ash content in the coal varies on a daily basis, say, from six to eight percent, would the amount of particulate going to the ESP vary on the order of 15 percent plus or minus over the course of the day?

MR. CICHANOWICZ: Approximately, yes.

MR. NELSON: And again the sorbent at three to five pounds adds about one or two percent of particulate load?

HEARING OFFICER TIPSORD: He answered that a couple times.

MR. ZABEL: May I follow up?

HEARING OFFICER TIPSORD: Yes.

MR. ZABEL: Describe the other half of the issue.

MR. CICHANOWICZ: Me?

MR. ZABEL: Yes, sir. I don't want Mr. Nelson to do it. He is questioning and not testifying.

MR. CICHANOWICZ: The other half of the issue is the nature of carbon. Carbon is in the particle size as you inject it

on the same order of fly ash, maybe a little bigger, 20 microns, but close to 12 to 15.

But the key thing is -- well, there are two key things. Number one, the density is about one-fifth of ash. Number two, its resistivity is a lot lower. And the events that happen in an ESP are such that the carbon can much easily penetrate or escape the ESP than the ash.

I can go into a prolonged description if you would like. But I don't know if you would like me to.

HEARING OFFICER TIPSORD: Thank you. I think you answered the question.

MR. ZABEL: I have a follow-up.

HEARING OFFICER TIPSORD: Go ahead.

MR. ZABEL: In your experience, Mr. Cichanowicz, dealing with testing of mercury removal projects, have the sources, the utilities been concerned with the impact on opacity and particulate emissions?

MR. CICHANOWICZ: Yes.

MR. ZABEL: Has the Department of Energy been concerned?

MR. CICHANOWICZ: Yes.

MR. ZABEL: Thank you.

HEARING OFFICER TIPSORD: You know what, we are way past break. We will get to Mr. Nelson after the break. But let's take a short break, and we will come back and we will get to your question.

(Short recess taken.)

HEARING OFFICER TIPSORD: If we are ready on the record, Mr. Nelson has some questions.

MR. NELSON: Mr. Cichanowicz was mentioning that he was concerned with increased carbon in the ESP, correct?

MR. CICHANOWICZ: Yes.

MR. NELSON: And did you say that carbon has a lower resistivity than typical fly ash?

MR. CICHANOWICZ: Yes.

MR. NELSON: Some plants in Illinois use flue gas emission, for example, SO3 injection. Is the purpose of this to

lower the resistivity of that fly ash so that the ESP performs better?

MR. CICHANOWICZ: The purpose of the flue gas as a precondition is to load the fly ash so that the resistivity is on the order of 10, 11 or so ohms. But carbon is on the order of ten to nine. So a carbon is a couple of orders of magnitude less resistivity than ash either from a high sulfur fuel or condition from SO3.

MR. NELSON: So on the filter cake on the ESP plate, if you had lower than two percent added carbon on the plate, for example, would the average resistivity of the fly ash on the plate be lower?

MR. CICHANOWICZ: I don't know that average resistivity is a relevant issue. I think the resistivity of the carbon particle is what the issue is.

MR. NELSON: But it does get mixed in with the fly ash on the plate?

MR. CICHANOWICZ: Yes, it does.

MR. NELSON: And since a significant amount of the emissions that block ESP is

due to re-entrainment and what happens on that plate, would you agree that the average resistivity on the plate is a consideration in the performance of the ESP?

MR. CICHANOWICZ: All other factors being equal, perhaps.

MR. NELSON: In your written testimony on page 39, for example, you testified that the installation of hundreds of low NOx burners to lower NOx emissions had the unintended effect of generating much higher unburned carbon, didn't you?

MR. CICHANOWICZ: Specifically, what are you referring to?

MR. NELSON: Did the installation of low NOx burners around the country to lower NOx emissions, did that generate additional unburned carbon going to all these ESPs across the country?

MR. CICHANOWICZ: Yes, but on a much larger particle size.

MR. NELSON: What is the particle

size of sorbent particles?

MR. CICHANOWICZ: 18 to 20.

MR. NELSON: 20 micros?

MR. CICHANOWICZ: Yes.

MR. NELSON: What's the average particle size of a fly ash particle that goes into these ESPs?

MR. CICHANOWICZ: A little less than that.

MR. NELSON: Would it be about five microns?

MR. CICHANOWICZ: I don't think it is that low. I think it was ten.

MR. NELSON: Do ESPs tend to work better on larger particles or smaller particles?

MR. CICHANOWICZ: They tend to work better on larger particles.

MR. NELSON: So the larger carbon particles.

MR. CICHANOWICZ: All things being equal, you are changing things again.

HEARING OFFICER TIPSORD: Excuse me, Mr. Nelson you need to let him answer the

question. You can't talk over one another. The court reporter can't get it. Do you have anything, Mr. Cichanowicz, on that question?

MR. CICHANOWICZ: No. We are mixing apples and oranges. The issue with carbon is that the particles are very low resistivity. And when they finally find their way to the plate because they are of such low resistivity they are not held in check as much of the electrostatic forces as the particles with a high resistivity. Therefore, they are subject to re-entrainment both in the semi-state plus also when the plates are wrapped. And that is the concern why small -- that is the concern why carbon particles with low resistivity of, essentially, pure carbon have a different -- can have a different trajectory and different path to the ESP than fly ash particle.

And I want this to be clear because Mr. Nelson's questions are accurate, but they are leading me in a path that is not

telling the whole story.

MR. NELSON: In your testimony you mentioned significantly increased carbon being generated by these low NOx burners that would go to the ESPs; is that correct?

MR. CICHANOWICZ: Generally, low NOx burners can produce ash with higher carbon.

HEARING OFFICER TIPSORD: Excuse me, Mr. Nelson, I don't want to interrupt your flow of questions. But I know notice that you are asking questions of page 38 and 39 of your testimony. But some of the stuff that we will get to with the questions from the Agency -- just for purposes of the record, I would like to keep this information together. Could you hold off on these questions?

MR. NELSON: Actually, we are talking about carbon going to the ESPs. The whole presentation on these ESP sizes deals with particulate collection. And this is the appropriate time, I believe,

to talk about that, correct?

HEARING OFFICER TIPSORD: All right.

MR. AYERS: Let me finish. I have a few more questions here. At the worst plants where low NOx burners were installed that generated all this additional carbon, how much did the carbon going to the ESPs increase?

MR. ZABEL: I am going to object. I don't understand what the characterization worst means. If you could explain the question, Mr. Nelson.

MR. NELSON: Mr. Cichanowicz in his written testimony said that when low NOx burners were installed at literally hundreds of plants in the United States to lower NOx emissions, that they generated significant unburned carbon adding to the ESP carbon loads. Is that not correct?

Did the installation of low NOx burners have the unintended effect of increasing significantly the amount of carbon going to these ESPs?

MR. CICHANOWICZ: No. You are

mischaracterizing my answers.

MR. NELSON: Do you disagree with that statement that low NOx burners significantly increased at many plants the unburned carbon going to the ESPs? Do you disagree with that?

MR. ZABEL: Again I am going to object. He puts characterization of terms in his questions that he doesn't define. I don't know what significantly means in that question.

HEARING OFFICER TIPSORD: Could you specifically tell us what part of Mr. Cichanowicz' testimony? I know you said page 39, but I am not seeing it there.

MR. NELSON: Mr. Cichanowicz' testimony at numerous places mentions the need for one-year long testing because of unintended effects of various technologies. I believe Mr. Cichanowicz spent a good deal of his professional career, a number of years, dealing with low NOx burners.

On page 39 he mentions this as an example of unintended effects of the installation of a new air pollution control technology.

HEARING OFFICER TIPSORD: Excuse me, I apologize for interrupting. But the point of my question is that Mr. Zabel is objecting to some of your characterizations. But I felt the way you were asking the question you felt you were repeating what Mr. Cichanowicz said. So I am trying to get a specific point that we can say that the characterization that you are offering is actually Mr. Cichanowicz' characterization, not yours.

MR. NELSON: Okay. Very specifically, Mr. Cichanowicz, did the installation of low NOx burners replacing the existing burners that happened at many, many power plants in this industry over the last 15 years, did it significantly increase? And by significantly, I mean go from unburned carbon in the fly ash from a couple

percent to five or ten percent, did that occur in the initial installations at many of these plants of low NOx burners?

MR. CICHANOWICZ: My problem is with your characterization of the word many. Indeed, there were some units whose carbon and ash as defined by loss of ignition increased numbers that we used to think were acceptable of, you know, three and four and a percent to numbers that are slightly higher.

But, Mr. Nelson, I believe you are mischaracterizing my testimony and trying to present the image that virtually every low NOx burner installed was associated or generated significantly higher carbon and ash. Perhaps maybe 50 of it increased from two or three percent to four or five percent LOI. And there might be a fraction of units now that are between five and ten percent. We have some in this case.

But I don't think that that's the vast majority of population of boilers.

And your words are at least mischaracterizing.

MR. NELSON: I will go with your numbers. You just said 50 percent went from two or three percent to four or five percent, right? Can we have -- can we read back his testimony there in the last question?

(Record read as requested.)

MR. NELSON: If half of the low NOx burner installations went from two to three to four or five and a fraction of them went to five or ten, okay, that would be an increase in percentage terms of at least one to two percent for those that you mentioned, correct, one to two percent increase in absolute terms in carbon going to the ESPs, correct?

MR. CICHANOWICZ: In residual carbon generated in the flame entering the convective pass and entering the ESP, yes.

MR. NELSON: Physically is there really much of a difference between the

devolatilized unburned carbon generated by these low NOx burners and the devolatilized activated carbon?

MR. CICHANOWICZ: The carbon particles generated in the flame are larger. They have less specific surface area per gram.

MR. NELSON: Is this why at a plant like Salem Harbor that you showed photographs of they can get 90 percent mercury removal without any carbon injection because they generate high fly ash, high carbons in their fly ash?

MR. CICHANOWICZ: I believe Salem Harbor also fires a coal imported from South America whose composition I cannot recall right now. But there -- so it may be somewhat of an outlier.

But again Salem Harbor has showed the pictures of the installed ESPs.

MR. NELSON: What is the carbon content of the Salem Harbor fly ash?

MR. CICHANOWICZ: I can't remember off the top of my head. But it is high.

MR. NELSON: Would it surprise you if it was over ten percent, as high as 15 and 18 percent sometimes?

MR. CICHANOWICZ: It probably is.

MR. NELSON: Now if ACI -- okay. Over the last decade then, there have been hundreds of boilers that have installed low NOx burners, correct?

MR. CICHANOWICZ: Yes.

MR. NELSON: So the industry has already effectively had years, literally years of trials looking at balance of plant effects of increased carbon at levels perhaps in some cases much, much higher than we are talking with sorbent injection, already has years of experience with injecting this into their ESPs; is that correct?

MR. CICHANOWICZ: Experience with residual carbon generated in the flame leaving the furnace and entering the convective pass and the ESP. I will say it hundreds of times to make sure that the differentiation is clear.

MR. NELSON: So if that is true, where are you -- do you insist on a year or many year-long experiments when there are literally hundreds of plants that have seen carbon increases into their ESP of materials that similarly get out mercury and are similar in physical characteristics?

MR. CICHANOWICZ: I don't agree they are similar in physical characteristics. I just said the surface area is less and the particle size is larger.

MR. NELSON: Thank you.

HEARING OFFICER TIPSORD: Thank you, Mr. Nelson.

MR. ZABEL: Just so the record is clear, I believe Mr. Nelson characterized it as carbon injected into the system. The loss of ignition carbon is not injected. It comes from the boiler, does it not, Mr. Cichanowicz?

MR. CICHANOWICZ: Yes, it does.

MR. ZABEL: Those particles went through the flame basically; is that

right?

MR. CICHANOWICZ: Yes, they have.

MR. ZABEL: I think we are on question 19 -- 18, sorry.

HEARING OFFICER TIPSORD: I believe we answered question 18. I think we are on question 19.

MR. CICHANOWICZ: On page 7 of your testimony in the second paragraph, you state "that the average content of Illinois basin coal fired can be considered to be 5.43 pounds per trillion BTU appears optimistic compared to alternative sources." I note this is a not a question but a statement.

Item 20, referring to figure 2-2 of your testimony, please indicate what Illinois mercury concentration corresponds to the 50 percent cumulative level.

In looking at that figure it appears to be approximately five pounds per trillion BTU or a little less.

Question 21, referring to the figure 2-4 of your testimony, please

indicate what Illinois mercury concentration corresponds to the peak or the mode of that distribution.

The answer is the same, approximately five pounds per trillion BTU or less.

Madam Chairman, this is a reason why somebody should not submit 90-page testimony, because you cannot proofread every page you would like to.

The important point that I was trying to make was regarding the role of the coal cleaning.

HEARING OFFICER TIPSORD: I am sorry, the role of?

MR. CICHANOWICZ: Coal cleaning. Coal cleaning is presently widely practiced on Illinois basin coals and delivers a significant amount of mercury removal, either 47 percent or 37 percent depending on the source of information.

It is possible that further mercury reductions by coal cleaning can be achieved in the reference that I cited by

Akers, which describes some means to do so. However, there is a cost that must be considered and weighed against other options.

A significant component of this cost will be the energy recovery penalty for the amount of coal left at the mine that does not survive the cleaning process. At present this amounts to about ten percent. But if this increases, the cost of delivered Illinois coal will proportionately increase.

Question 22 --

MR. AYRES: I take it, Mr. Cichanowicz, that your testimony stands with respect to your two figures, the numbers that you cite or that are apparent on those two figures, figure 2-2 and figure 2-4, essentially confirm the 5.3 pounds per BTU assumed by the Illinois EPA; is that correct?

MR. CICHANOWICZ: Yes. The data in the charts came from the ICR I don't know if it was part 3 that characterizes the

data. And what's accurate is the data in the charts and not the statement.

MR. AYRES: So then would you change your testimony about the 5.43 pounds being optimistic?

MR. CICHANOWICZ: Yes, correct. That's a mistake. The data described in the charts is the accurate data.

MR. AYRES: Thank you.

HEARING OFFICER TIPSORD: Question 22 is actually not a question again. I see it is just a statement.

MR. ZABEL: Do we need to read that?

HEARING OFFICER TIPSORD: No. We will go on to question No. 23.

MR. CICHANOWICZ: Are you suggesting that the averaging provides little benefit to address variability and uncertainty, so little that power plants have to emit only about half of the mercury emissions they are actually permitted to in order to have assurance of compliance?

HEARING OFFICER TIPSORD: Just for the record, I would note that the

averaging we are referring to is in the statement on question 23.

MR. CICHANOWICZ: Variability in process operations and measurement is considered in the design of any processed equipment to meet a commercial guarantee. For example, I am aware that in the design of flue gas desulfurization equipment a guarantee for 96 percent SO2 removal on a 30-day rolling average basis requires the suppliers to design for 98 percent, half of the targeted outlet value.

It is not unusual in my experience for design margins to exceed projected or guaranteed values by two to five percent. Of course, these are target values which may be attained only sporadically.

HEARING OFFICER TIPSORD: Mr. Ayers?

MR. AYRES: Since there appears to be little benefit to the power plants in the 12-month averaging according to your testimony and there is an environmental benefit to eliminating it, would you suggest eliminating the averaging

provisions from the proposed rule?

MR. CICHANOWICZ: No. I don't recall where I said there was no benefit of 12-month averaging. I believe --

MR. AYRES: To me that appears to be the burden of your testimony on this point.

MR. CICHANOWICZ: I am not sure how you come to that conclusion.

MR. AYRES: I can't cite an exact sentence either right now.

MR. CICHANOWICZ: All I am saying is that the 12-month averaging may not accurately capture the entire picture. But again, I am -- this issue is really addressed from the supplier's standpoint; that is, you have to design something for a few percentage points over what you think it is going to be in order to be able to assure that you can deliver the number.

MR. AYRES: Well, there are two kinds of variability in the question here. I take it one is variability in the

performance of the control equipment and the other would be variability in the coal -- in the mercury content of coal.

And I think the statement on -- which is not a question -- statement No. 22 quotes your testimony to say the 12-month rolling average will not eliminate variations; is that correct? I take that to mean that you don't believe the averaging provision will do much to protect against either of those kinds of variability? Am I incorrect?

MR. CICHANOWICZ: No. The averaging provision protects against that. All I am saying is that there can be variations that, essentially, the averaging provision will not be able to correct for. The averaging works as long as the events that push you one way are about the same as the events that push you the other way. We see that all the time in emissions averaging.

And all I am saying is that for confidence in meeting this level, you are

going to want to be on the safe side and make sure that you have the things pushing you high. So you always can compensate for short-comings.

For example, if you lose a sorbent injection heater or something on that order, even for short periods of time, at these kinds of levels, you have to work really hard to compensate for that. If you have some aberration in the injection of the sorbent equipment and for only a couple of -- for a short period of time, if you are completely out of service and getting zero mercury removal, then you have to work really hard for the rest of that time because your only margin above that is 90 to the 99 percent.

This is not new. This is not -- this is what we have gone through with SCR for decades.

MR. AYRES: I understand that. But you agree then that the rolling average way of calculating compliance does add or reduce the potential problems created by

these variabilities.

MR. CICHANOWICZ: Yes, I agree.

HEARING OFFICER TIPSORD: Mr. Nelson?

MR. NELSON: Sid Nelson, quick question. Of the ten or so commercial activated carbon injection utility systems that have been ordered so far, are you aware of any that don't have back-up heaters?

MR. CICHANOWICZ: No, I am not aware of any that don't have back-up heaters.

HEARING OFFICER TIPSORD: Mr. Ayers?

MR. AYRES: I will pass.

HEARING OFFICER TIPSORD: Question 24. Mr. Zabel, question?

MR. ZABEL: No, I'm sorry.

MR. CICHANOWICZ: On page 11 of your testimony, third paragraph, you state that one standard deviation in coal mercury concentration should be used to calculate necessary removal rates. What is the basis of using one standard deviation? Please discuss, in detail, the statistical theory for choosing this number.

I am not an expert in statistical methods and not prepared to address in detail the basis of selecting one standard deviation to describe variance. Please note that the passage is an example and simply illustrates that limiting the description of coal mercury content to the mean value will not reflect the variability in the coal supply. The method that one chooses to address variability in coal content is not important; but the role of variability should be considered.

Question 25, are you familiar with linear regression statistical methods?

Only in a general sense to infer a relationship or derive a correlation from a data set.

MR. AYRES: We are probably on the same level. Could I ask a couple questions about the follow up on that? Are you aware that it is possible, in fact, a widely used statistical technique, to use the correlation coefficient or the

R squared of a regression to determine confidence intervals for a projection based upon a regression?

MR. CICHANOWICZ: Yes.

MR. AYRES: You have seen performance curves presented by Dr. Staudt in his testimony earlier?

MR. CICHANOWICZ: Yes.

MR. AYRES: By Mr. Nelson and by others in the industry --

MR. CICHANOWICZ: Yes.

MR. AYERS: -- showing mercury removal versus sorbent injection rate for specific coal types?

MR. CICHANOWICZ: Yes, I have.

MR. AYRES: Is it fair to say that most people in the industry represent the data in this regression way?

MR. CICHANOWICZ: Depending on what you are trying to do with it, the answer to the question is yes.

MR. AYRES: Why then in formulating confidence levels, even for example, did you not use this method?

MR. CICHANOWICZ: Because it was an example. I was just trying to deliver the message that variability needs to be considered.

MR. AYRES: Finally, isn't it true that a unit that was concerned about fuel variability could eliminate that concern simply by complying with the 90 percent reduction requirement rather than trying to meet an output standard?

MR. CICHANOWICZ: Yes. That is true. And a lot of further questions address this. The 90 percent level is an important option.

MR. AYRES: Thank you.

HEARING OFFICER TIPSORD: Question 26.

MR. CICHANOWICZ: On page 11 of your testimony, third paragraph, you give an example using a PRB coal of why more than 90 percent removal is required to achieve the output-based standard reliably.

Question A, wouldn't a bituminous coal user be more likely to use the

output-based standard than a PRB user due to the lower average mercury content of Illinois coal? Depending on the mercury content, the answer is yes.

B, from figures 2-2 through 2-4 is the standard deviation in the mercury content of Illinois coal less than that of PRB coal?

The standard deviation for Illinois coal of 3.25 is slightly less than the standard deviation of PRB coal of 3.6.

Question C, based on your theory, would a lower average coal mercury content and a lower standard deviation result in lower necessary mercury control rate by your method?

Well, first, it is not a theory. It was just an example. But I do concur that a lower average mercury content in a lower standard deviation would necessitate a lower mercury removal level.

Question 27, if only 90 percent removal is necessary, why do you argue that 93.7 percent is needed?

If the 90 percent maximum limit is adopted, then I agree that the removal will be capped at that value. The important message is that a fixed cap or max emission rate should always account for variability in coal. Depending on the coal mercury content, the fixed emission rate may require slightly less than 90 percent mercury removal. But coal variability for periods would elevate the required removal to above 90 percent. A mechanism should be in place to allow invoking higher either the 90 percent cap or the fixed rate over the 12-month rolling average period.

Question 28, if the concentration of the mercury in a plant's coal was high enough that the 90 percent requirement was easier to attain, wouldn't they just comply with the removal standard instead of the output-based standard? If so, why then would they have to control greater than 90 percent as you testify?

Again, I concur that providing a

maximum mercury removal option to a fixed emissions limit is preferred to meeting an invariant output standard. Again, the message is that the rule should contain the flexibility to invoke either target over a 12-month rolling average period.

MR. AYRES: Mr. Cichanowicz, doesn't the rule allow the use of either method over the 12-month period? I believe it can be adjusted. But again -- I am sorry, answer my question.

MR. CICHANOWICZ: I think so. But I can't understand the rule the way a regulator would that would interpret it. And so I'm just -- I put these uncertainties in to make sure that the message is delivered.

But if that's the way it is written and if that's the way it is interpreted, that's fine. But I can't parse out the language enough to know what people will really do.

MR. AYRES: So if it is written that way, as I think it is, then the concern

that you raised here about the output standard really wouldn't be a concern?

MR. CICHANOWICZ: That is correct. It still means that if you think you need 86 percent to get the fixed rate, you know, if I am advising the designer, we go for a higher number.

But there is no doubt you would elect the 90 percent option whenever you can. I am just not sure about the flexibility over the 12-month period to go in and out of that. And that was the whole purpose of that -- of that passage.

MR. AYRES: I won't testify further then.

HEARING OFFICER TIPSORD: Mr. Harley?

MR. HARLEY: Keith Harley. Could you explain how your response to that question is informed by the rules provisions that allow for flexibility by averaging among units?

MR. CICHANOWICZ: I'm sorry, Mr. Harley, I don't understand the question. Could you help me a little bit?

MR. HARLEY: Are you familiar with the provisions of the proposed rule that allow for averaging among units?

MR. CICHANOWICZ: Yes.

MR. HARLEY: Does that provide an additional level of flexibility that would cause you to reconsider your answer?

MR. CICHANOWICZ: It provides both an additional level of flexibility and an additional risk because then you, essentially, have to deal with units that might be underperforming. So I don't think it significantly affects my answer.

MR. HARLEY: Are you familiar with the rules provision -- with the provisions of the rule that provide flexibility through the technology-based standard?

MR. CICHANOWICZ: That depends. I have read the technology-based standards. And I think the spirit of it is good.

Again, I can't parse out words. That's not to say it is not written well. It just says that I don't normally read rules and try to figure out exactly what

they mean because I know there is a lot of stuff that goes on that is not hit on sometimes.

MR. HARLEY: Would that be fair to characterize that as providing an additional level of flexibility that might change your answer as to whether or not the rule allows adequate flexibility for any operator?

MR. CICHANOWICZ: I don't think my answers change. Because as I read the TTBS, it does appear to offer flexibility, but it does appear to be limited. And I just can't tell -- I just can't tell sitting here whether it has adequate flexibility or not. It may not.

MR. HARLEY: Because you don't possess the requisite expertise that a regulator, for example, would in implementing that rule?

MR. CICHANOWICZ: The answer is I can't follow the long convoluted sentences.

MR. HARLEY: Thank you for that

answer. Are you familiar with the recently proposed modification to the rule called the multi-pollutant standard?

MR. CICHANOWICZ: No, I am not.

MR. AYERS: Let me ask one further question along those lines.

HEARING OFFICER TIPSORD: Sure.

MR. AYRES: Are you aware of the provision of the Board's rules which allows for variances for units that are in -- that have problems meeting standards as a general matter?

MR. CICHANOWICZ: Could you repeat the question? I'm not trying to be difficult.

MR. AYRES: Are you aware of the fact that the Board has in its general rules or in the general rules of the agency a provision for variances for units that are unable to achieve standards?

MR. CICHANOWICZ: I can't recall the details right now of those provisions. But my point -- my point is that we need the flexibility as much as possible to

account for some of these variations. And I don't --

MR. AYRES: The reason I ask is because you mentioned the TTBS is limited to being applicable to a certain number of units or certain capacity.

MR. CICHANOWICZ: My understanding is that it's limited to 25 percent of capacity.

MR. AYRES: And the availability of the variance is not so limited, is it?

MR. CICHANOWICZ: I don't know. Is that true?

MR. AYRES: That's my understanding.

MR. CICHANOWICZ: I don't know. I have spent my time on the technology, Mr. Ayers, not the rules.

HEARING OFFICER TIPSORD: I think the Board can stipulate that we know what the variance provisions are.

MR. AYRES: So there are multiple flexibility mechanisms that we have just gone through that would help any of the units that for some reason didn't choose

to achieve 90 percent and chose the output standard and had the variability issues that you were saying?

MR. ZABEL: I am going to object. He said he doesn't know what the variance provision is; therefore, he can't answer whether it is flexible or not because he doesn't know how it would apply, obviously.

HEARING OFFICER TIPSORD: I think that's a legitimate objection.

MR. AYRES: I will drop that from the question and ask him with all the other parts.

MR. ZABEL: Can you restate it or should we read it back and have the court reporter edit as she goes?

MR. AYRES: Why don't we drop it.

HEARING OFFICER TIPSORD: Question 29.

MR. CICHANOWICZ: On page 12 of your testimony you state "given the evolutionary nature of mercury CEMS, there is no documented reason to believe that

the sum of all errors, either overreporting or underreporting mercury content over a 12-month period will equally compensate." Do you have any evidence that 20 percent errors are systematic and, therefore, would be additive?

My understanding is that the limited experience to date with mercury monitors neither supports or refutes whether systematic errors are additive or canceling. The presumption that a 12-month rolling average negates concern for errors presumes such errors are canceling.

Question 30 --

MR. AYRES: Sorry.

HEARING OFFICER TIPSORD: Mr. Ayers?

MR. AYRES: So you are testifying you have no basis on which to determine that there is any systematic error in these measurements in the current level of understanding of CEMS?

MR. CICHANOWICZ: My understanding

of CEMS -- and again this comes from Mr. Richard McRanie -- is that it's too early to tell if there is -- if the errors are systematic or if they are canceling. And that's the purpose of the, if I can call it, mercury analyzer shoot out at Progress Energy Plant, is to look at all those issues.

MR. AYRES: So couldn't you say based on what you know now equally truthfully or equally accurate that given the evolutionary nature of CEMS, there is no documented reason to believe that the sum of all errors will not be equally -- will not equally compensate?

MR. CICHANOWICZ: That is in effect what is assumed, I think, with the 12-month rolling average, that they will be canceling.

MR. AYRES: But you seem to be questioning that, whether that was adequate. And I think if you are saying that you -- there is no evidence on either side here, then you -- you seem to be

looking at it in the most pessimistic possible frame.

MR. CICHANOWICZ: All I am saying is that my understanding of mercury CEMS is limited. And I understand the jury is still out on how these units are performing in terms of accuracy and precision and reliability.

MR. AYRES: But we have no reason to believe at the moment that they are biased.

MR. CICHANOWICZ: No reason that I can give you. But it is beyond my skill set.

MR. AYRES: Okay.

HEARING OFFICER TIPSORD: Question 30.

MR. CICHANOWICZ: If real evidence of systematic errors did exist in the coal analysis as you describe on page 12, the uncertainties in mercury measurement were addressed in an early study by EPRI that was conducted in concert with the ICR coal measurement program. The results showed

that for the most widely used ASTM D3684 method, employing the oxygen bomb approach, both a high and a low bias of reported mercury content was witnessed among participating laboratories. Specifically, a high bias to actual mercury content was noted for low ash coals, while a low bias to actual mercury content was noted for high ash coals, reference to Goodman 2006. Another widely used method, EPA 7476, exhibited a low bias.

That was a statement. Question A, could these uncertainties not be compensated for and would not EPA and ASTM recommend such compensation? If ASTM has not recommended compensation, why not?

The answer, in concept, any bias could be compensated for. However, this requires first recognizing and understanding the source of the error and then developing some means to compensate for the error. All of this needs to happen while the mercury emission

techniques to determine -- while using the mercury measurement techniques to determine compliance. I am not aware of the procedure in time required to develop an adequate means to compensate bias in this manner.

B, what does the citation to Goodman 2006 refer to? The statement cited in my testimony and quoted as part of this question is based on a telephone conversation with Naomi Goodman of EPRI regarding the results of an EPRI sponsored study. This study, conducted in the late 1990s in preparation for the ICR program, consisted of a round-robin evaluation in which split samples were used in comparative tests of coal mercury content as measured by different laboratories.

MR. AYRES: Madam Hearing Officer?

HEARING OFFICER TIPSORD: Mr. Ayers?

MR. AYRES: Your source Goodman is a personal communication?

MR. CICHANOWICZ: EPRI published a report that they -- that was used in

helping utilities prepare for the ICR program. In the mid '90s, a lot of work was directed to trying to sort out and improve mercury measurement programs because of the upcoming effort.

That report I tried to get released into this proceeding because usually EPRI reports, once they are seven or eight years old, you are in position to release them from the funders. And I hoped to do so by this time, but I had not yet received that report.

And all I am referencing is the conversation with the woman who was the project manager, who basically told me what the bottom line was.

MR. AYRES: So we don't have any documentation of the statement in the record?

MR. CICHANOWICZ: That is correct.

MR. AYRES: If she is the credible person to make statements regarding these tests -- and I think I heard her name being Naomi, is that right, so I think I

am using the right gender here. If she is, is it possible to -- for us to hear from her rather than to have hearsay testimony on this point?

MR. ZABEL: Experts rely on hearsay all the time, Mr. Ayres. I don't think it would be possible to bring an EPRI witness in.

MR. AYERS: Why would that be?

MR. ZABEL: Timing, availability, expense.

MR. CICHANOWICZ: The way I structured this, I thought the report would be available to use in these proceedings. And it still might be.

Just to remind everybody, there are certain reports that EPRI keeps. They summarize the gist of it to meet the requirement that it is publicly funded from rate payers and information does need to go into the public domain. But a lot of the details they keep for the funders, otherwise, there is no incentive to join the organization.

But usually after this amount of time, you are able to get the report released. And I was working on trying to do so and haven't given up yet.

And I do agree that having that analysis is far better than hearing me say what is in there.

HEARING OFFICER TIPSORD: I do understand that you have a CD-rom, a disk, of reference materials. So we can enter it into an exhibit. Would you explain what these are?

MS. BASSI: These are two disks that are Mr. Cichanowicz' references except for I think he said eight or ten historical references that he hasn't been able to pull together, and we can send them if you want them. Here are five copies for the Board. And here is a copy of each disk for the Agency and for you and --

MR. ZABEL: Mr. Nelson, I don't believe you have an appearance filed. I don't think we have to give him one. If you have an extra copy, please do. Do we

have an extra?

MS. BASSI: Yes.

MR. ZABEL: Give him one.

MR. AYERS: We are still on question 30, I believe.

MR. ZABEL: I think we were on 30-B, yes.

MR. AYRES: Yes.

HEARING OFFICER TIPSORD: All right. This will be marked -- this is a two-disk set. And we will mark this as Exhibit 96, if there is no objection.

MS. BASSI: Pardon me, what was 95?

HEARING OFFICER TIPSORD: 95 was Will County 1 through 4.

MS. BASSI: Thank you.

HEARING OFFICER TIPSORD: Seeing none, this is Exhibit No. 96.

MR. AYRES: The final question on 30-B.

MR. RAO: Before you ask the next question, Mr. Cichanowicz, you mentioned this EPRI report that you had a conversation with someone.

MR. CICHANOWICZ: The project manager.

MR. RAO: Would it be possible for you to provide a citation to the report if you have one?

MR. CICHANOWICZ: Yes, I will provide a citation to the report and I hope to provide the report. I will at least get a citation to you next week. And I would like to get the report to you.

MR. RAO: Thank you.

MR. CICHANOWICZ: Question 31 --

HEARING OFFICER TIPSORD: Mr. Harley?

MR. HARLEY: Before we go on to question 31, the testimony that you have provided in response to the questions suggest that you have some questions of your own about the reliability of mercury monitoring equipment; is that correct?

MR. CICHANOWICZ: Well, again not being an expert, I can't talk of the details. But having worked for 25 and 30 years with continuous emissions monitoring systems, it is -- the new

babies on the block at least take awhile to get sorted out. And I believe this will be no different.

MR. HARLEY: But much of your testimony this morning was based on Exhibits 85, 86, 87 and the primary materials that you used to characterize that, which is based on monitoring data; is that correct?

MR. CICHANOWICZ: It is based on monitoring data during a short-term performance test, which I think will be different than monitoring data 12 months out of the year.

MR. HARLEY: Thank you.

MR. AYRES: Shouldn't monitoring data on a 12-month basis be more reliable than short-term monitoring data?

MR. CICHANOWICZ: If the monitor is working the same, yes. This is out of my skill set. But all I know is that the whole issue of maintenance of monitors is something that needs to be considered. And a lot of times when you are conducting

a test, you have people on-site or you are in a building -- you are in a position to be able to keep the monitors operating the way you want.

And over a 12-month period -- over a 12-month period, basically, you may not be able to make them work to the same degree.

MR. AYRES: So your testimony is not that you have any reason to believe that the monitoring will be inaccurate or any data to believe that, except for a vague feeling that monitoring takes time to work. Is there anything different between this situation, this monitoring situation, and previous monitoring situations in terms of, you know, the regulation comes, people deploy the monitors, they learn how to use them and we go forward?

MR. ZABEL: Is that a question, Mr. Ayers?

MR. AYRES: That was a question.

MR. CICHANOWICZ: It is not a vague theme. For example, one of my roles in life other than working on mercury is on

SCR NOx reduction. I am the lead author of an EPRI guideline which is an operation and maintenance guideline for SCR process equipment. A very major component of that guideline is making the monitors work. Because all you need to do is lose the monitor for a short period of time and you really don't know how much ammonia to inject.

So here we are in 2005 and 2006 -- and I do agree that the NOx monitors are working well. But to do so 24 by 7 is another plane, another threshold, another hurdle that is different that happens in testing.

So I have it is stuck in my claw that, yeah, monitors aren't easy to operate and you do need to put a lot of maintenance in them depending on the type of monitor to make them work. And that comes from my expertise in NOx.

In mercury, I don't see why it is going to be very different. But this is out of my skill set.

MR. AYRES: So we are -- so you don't have -- you have no reason to assume that there is any difference between this situation and ones we have seen before where monitoring has to be done. EPA establishes standards and people monitor to those standards. Is there something peculiar about mercury that the Board needs to take into account with respect to this?

MR. CICHANOWICZ: Well, if I try to answer this question --

MR. AYRES: Or shall we talk to Mr. McRanie?

MR. CICHANOWICZ: Talk to Mr. McRanie about it.

HEARING OFFICER TIPSORD: Mr. Harley?

MR. HARLEY: Are you familiar with the provisions of the Illinois Administrative Code that allow operators flexibility during periods of malfunction of equipment?

MR. CICHANOWICZ: No, sir, I'm not.

MR. HARLEY: Thank you.

HEARING OFFICER TIPSORD: Question 31.

MR. CICHANOWICZ: Would you prefer quarterly Ontario Hydro measurements upstream and downstream of emissions control devices as required in some states or upstream and downstream CEMS as used in numerous DOE programs to demonstrate percent mercury capture?

I am not sure how quarterly measurements would work on a 12 -- on a rolling 12-month average. But I am not an expert in measurement techniques. I wish to defer this question to Mr. Richard McRanie.

Question 32, on page 13 of your testimony of you state that several 30-day tests of ACI into an ESP and a one-year long trial with ACI into a fabric filter all exhibit variations in mercury outlet. Specifically, data from 30-day trials at Holcomb, Meramac and St. Clair suggests that, depending on the unit, mercury removal varied between approximately 85

and 97 plus percent. The average mercury removal reported for these trials, 91 percent for St. Clair and 93 percent for Holcomb and Meramac, suggest these variations are not of consequence. That was a statement.

Question A, do each of those boilers primarily burn western coal? Yes.

Question B, what type of coal is primarily burned in unscrubbed Illinois plants? PRB, the same as the referenced units.

Question C, doesn't this demonstrate that 97 percent removal does occur for short periods, thereby addressing your concerns about variability?

This data shows 97 percent mercury removal can be achieved for short periods. But we don't know how representative are these variations that are observed over a 30-day period during a demonstration test. Specifically, we have no knowledge of the relative occurrence of variations that elevate mercury removal compared to those

that degrade mercury removal.

In order for this degree of variability to authentically reflect that incurred over 12 months, all operating issues, plant upsets and equipment reliability concerns witnessed over the 30-day period must be reflective of the 12-month term. For example, any disruption of sorbent injection or bias and distribution would promote variations to compromise mercury removal, which may or may not be compensated for by elevations that compensate mercury removal.

Question 33, you further state that "perhaps more significant is the variability in mercury control at Yates 1 where the injection of four pounds per million ACF of conventional activated carbon into a small ESP produced a total mercury removal of 60 to 85 percent, the result of inherent variations in boiler operation, sorbent injection rate and inherent mercury removal." This is a

statement.

Question A --

MR. AYERS: Mr. Cichanowicz, before you go to A, can you explain what you mean by inherent in that sentence?

MR. CICHANOWICZ: Inherent mercury removal?

MR. AYERS: Yes, for all of our edification.

MR. CICHANOWICZ: Inherent mercury removal is the removal that you would get without sorbent injection.

MR. AYRES: Thank you.

MR. CICHANOWICZ: Question A, is not Yates 1 a scrubbed unit using wet FGD without SCR in firing bituminous coal? Yes.

Question B, how many Illinois units fit this description? None.

Question C, over what range did the cobenefit ESP mercury removal vary?

Yates unit 1 cobenefit mercury removal averages 34 percent with most points between about 20 and 50 percent.

D, is it possible that poor sorbent distribution may have contributed to the poor performance at Plant Yates?

Poor sorbent distribution will compromise the mercury removal of any plant, and Yates is no exception to that observation.

Question 34 --

HEARING OFFICER TIPSORD: Mr. Ayers?

MR. AYRES: Weren't sorbents from different suppliers tested at Yates, each one showing a different performance, some better, some worse?

MR. CICHANOWICZ: Yes.

MR. AYRES: Wouldn't this also account for the different ranges of removal experience at Yates?

MR. CICHANOWICZ: I believe my statement was based on the 30-day test with the one HOK.

MR. AYRES: I'm sorry?

MR. CICHANOWICZ: I believe my observation was based on one type of sorbent, the German HOK.

MR. AYRES: If the fuel were changed during the test period, would that make a difference also potentially in the performance?

MR. CICHANOWICZ: Yes, fuel changes can affect the current mercury removal.

HEARING OFFICER TIPSORD: Question 34.

MR. CICHANOWICZ: Would it be correct to state that the example in section 2.5 of your testimony describes your reasoning why over 90 percent reduction is needed to achieve the output-based emission rate?

Yes. But depending on the coal content, as addressed previously, figure --

MR. AYRES: Are you on 35? I think that has been asked and answered.

MR. CICHANOWICZ: It has been asked and answered. Thank you. There's a few others in that league I think. I think 35 --

MR. AYRES: Among us we will

identify them all.

HEARING OFFICER TIPSORD: Then we are ready for 36?

MR. AYRES: 36.

MR. CICHANOWICZ: In your testimony in section 2.5 you include measurement uncertainty as an additional reason to over control. However, you previously testified, page 2, "in this testimony I will accept without verification or other validation that such measurements can be made to within a reasonable degree of accuracy, precision and bias." Are these statements inconsistent?

Answer, I believe these statements are consistent. The message is that even a total 20 percent relative accuracy adequate to pass a RATA test still requires some level of over control to assure compliance.

Question 37 --

HEARING OFFICER TIPSORD: Excuse me, Mr. Ayers has a follow-up.

MR. AYRES: Mr. Cichanowicz, besides

the statement by Ms. Goodman, the phone conversation, and your apparent assumption that emissions measurement uncertainties are systematic and uncorrected and not random, what else is there -- or what is your basis for adding 20 percent marginal error?

MR. ZABEL: I am going to object. I believe he has mischaracterized Mr. Cichanowicz' testimony. But I will allow Mr. Cichanowicz to go ahead and answer.

MR. CICHANOWICZ: Well, I didn't add 20 percent. I believe this passage from 2.5 is the same thing that we have been talking about. I'm not talking about another 20 percent.

What I did in section 2.5 was just create a couple of examples just to show that if you are going to deal with measurement variability and coal variability, what type of margins would be required. And we got a little off track because a lot of the numbers ended up

being above 90 percent. And I didn't clearly enough state in the testimony that I agree 90 percent was the threshold. This is not in addition to anything else I have stated before.

MR. AYRES: I just want to be clear that your margin for measurement error is based on those two factors, conversation with Goodman and assumptions about emission measurements are being systematic?

MR. CICHANOWICZ: Yeah, I --

MR. AYRES: I understand what you just said about this one 20 percent and not two 20 percent.

MR. CICHANOWICZ: Yes, correct.

MR. AYRES: With regard to addressing uncertainties, are you familiar with weighted averaging methods for control and forecasting?

MR. CICHANOWICZ: Only in a general sense.

MR. AYRES: Won't owners take steps to address measurement uncertainty to the

extent it exists?

MR. CICHANOWICZ: Yes, they will to the extent that they can.

MR. AYRES: And isn't it true that process controllers, including those in utility plants, routinely use these and other methods to address these kinds of measurement uncertainties and other uncertainties in a facility?

MR. CICHANOWICZ: That is consistent with my understanding, yes.

MR. AYRES: So there are techniques for dealing with this kind of uncertainty? Disciplines instead of techniques.

MR. CICHANOWICZ: Those are true statements. Yes, I agree.

MR. AYRES: Thank you. 37 I think has been asked and answered too.

MR. CICHANOWICZ: Thank you.

HEARING OFFICER TIPSORD: Question 38.

MR. CICHANOWICZ: On page 16 of your testimony, you describe a scenario where a unit achieving under 90 percent removal

must be averaged in with other units to achieve a 90 percent average causing the others to have to achieve higher than 90 percent removal rates to compensate. If compliance with the emissions requirement is not possible, isn't it true the owner would have the option to use the TTBS of the proposed rule to take the under-performing unit out of the average until they can remedy the performance of the under-performing unit?

Depending on the form of the TTBS that is adopted and the provisions for determining if a mercury control technology is underperforming, it is possible the TTBS can provide some relief as described.

HEARING OFFICER TIPSORD: Excuse me, Mr. Ayers has a follow-up.

MR. AYRES: Mr. Cichanowicz, we would like to show you a document that we don't want to fall too far behind in exhibits. We have a document called -- written by an organization called NESCAUM.

And the document is called "2004 Environmental Regulation and Technology Innovation Controlling Mercury Emissions from Coal-Fired Boilers." And we ask that that be entered into record.

HEARING OFFICER TIPSORD: If there is no objection, I will admit "Environmental Regulation Technology Innovation," September 2000 as Exhibit 97. Seeing none, it is marked as Exhibit 97.

MR. AYRES: Mr. Cichanowicz, would you look at page XVI of the preliminary material summary?

MR. ZABEL: What page?

MR. AYRES: XVI, little X, little V, little I. Do you see a sentence there that starts "research and development of efforts"? Would you read that?

MR. ZABEL: Before he does that, Madam Hearing Officer, I am not going to object to the questions as such, simply state that the whole document -- we are looking at the conclusions right now -- may have qualifiers or other explanation

in it that may not be brought out in the course of the questioning. The document will speak for itself in its entirety.

HEARING OFFICER TIPSORD: Okay. Thank you.

MR. ZABEL: I am sorry, Mr. Ayers. Go ahead.

MR. AYRES: Do you see a sentence there that begins "research and development efforts"?

MR. CICHANOWICZ: Yes, I do.

MR. AYERS: Could you read that for us?

MR. CICHANOWICZ: "Research and development efforts are unlikely to be sustained at a vigorous level in the absence of regulatory or other drivers capable of creating a viable market for advanced control technologies."

MR. AYRES: Do you agree with that statement?

MR. CICHANOWICZ: In a general sense without reviewing the report. I don't think there is any controversy if the

research basically follows the need.

MR. AYRES: So there wouldn't be an incentive for a company to invest if it didn't have a chance to make a return on its investment on pollution control equipment, correct?

MR. CICHANOWICZ: Would you repeat that, please?

MR. AYRES: I will try.

MR. CICHANOWICZ: I am not trying to be difficult.

MR. ZABEL: You might get the microphone a little closer because it is a little difficult to hear you sometimes.

MR. AYRES: The question I think was would a company have any incentive to invest in new pollution control technology in the absence of demand created for it by regulatory or other drivers?

MR. CICHANOWICZ: I think in general the incentive is in proportion to the degree of regulation.

MR. AYERS: Are you aware that EPA's estimates are that CAMR will not drive

major demand for mercury specific control technology for ten years, possibly more, because of the ability to make cobenefit reductions achieved through CAMR?

MR. CICHANOWICZ: I am not aware that EPA has come to that conclusion.

MR. AYERS: In light of the business uncertainties over that ten-year period and long wait for significant sales, do you think there is a strong motivation for private sector technology investment in mercury controls over this period?

MR. CICHANOWICZ: I feel like I am saying the same thing. The incentive to invest is in proportion to the regulatory requirements. So what you cited to me was EPA's opinion about what was going to happen over the next ten years, then I can't react to it because I haven't seen what they have done.

But I am not disagreeing that to the mere extent there are regulations, the more investment people will make above and

beyond what many utilities do by funding EPRI and by doing some work basically on their own.

MR. AYRES: Thank you.

HEARING OFFICER TIPSORD: Question 39.

MR. CICHANOWICZ: In section 3.2 of your testimony, and specifically figure 3.1, question A, what do the percentages in the 1982 reliability survey represent?

The percentages in the FGD reliability survey reflect the fraction of time the FGD process was operable compared to, e.g., normalized by the operating hours of the generating unit over a year.

MR. AYRES: I'm sorry, now I am having trouble hearing you.

MR. CICHANOWICZ: Do you want me to repeat that, Mr. Ayers?

MR. AYERS: Please.

MR. CICHANOWICZ: The percentages in the FGD reliability survey reflect the fraction of time the FGD process was operable compared to the hours -- the

operating hours of the generating unit over a year.

Question B --

MR. AYRES: I am sorry, I have one follow-up on that.

HEARING OFFICER TIPSORD: Go ahead.

MR. AYERS: Who performed that study, was it EPRI or somebody else?

MR. CICHANOWICZ: No. It was a company now gone called Petco Environmental. And there was a person there, Bernie Laskey, who in the late '70s and early '80s did a lot of surveys. It was an EPA-funded survey.

MR. AYERS: Okay. Thank you.

MR. CICHANOWICZ: The FGD market -- this is question B of 39. The FGD market appeared to be fairly slow prior to the late 1970s. Was the pick up on business in the late 1970s largely due to New Source Performance Standard requirements?

The revision to the SO2 New Source Performance Standards in 1979 was likely a

key contributor to the expanding FGD market.

Question C, does not this increase in business also coincide with improvements in removal efficiency?

Several factors may contribute to the gradual increase in FGD removal efficiency. These include an improved understanding of FGD process chemistry based on intensive research initiated in the mid '70s by EPA, EPRI and the supplier community. The ability to establish high SO2 removal benchmarks within a 30-day rolling average also was desirable to compensate for periods of reduced performance due to the scaling, deposition and plugging that plagued early generation reaction vessels.

MR. AYERS: Then you do agree that your table is evidence supporting the NESCAUM conclusion that regulatory drivers produce rapid technological change?

HEARING OFFICER TIPSORD: Can you define NESCAUM and give it to the court

reporter?

MR. AYERS: N-E-S-C-A-U-M.

MR. ZABEL: Excuse me, use of the term rapid in your question is not in the conclusion you had him read previously. I think it's a mischaracterization, Mr. Ayers.

MR. AYERS: I would be happy to have you read out the conclusion.

MR. ZABEL: I ask you ask the question directed at that statement, rather than characterize it.

MR. CICHANOWICZ: Is the question directed to reliability or to removal efficiency?

MR. AYERS: Removal efficiency in particular.

MR. CICHANOWICZ: That was some of it. But, you know, I was -- I joined EPRI in 1978 and worked side by side with the FGD process crew. And they did a lot of the research that took the understanding from, essentially, guessing where the chemistry was going to be to

having it now in 2005 where it is about as well controlled as any process you can find.

A lot of that incentive was because the loss of control of chemistry created deposits in scaling that basically shut down the units. So it was an intense effort to figure out how to prevent all the scaling and deposition that would compromise the reliability of the unit.

Further, because many units were on a 30-day rolling average, it is the thing about having five or seven days where you are out of whack, you have to make up and you have to drive hard. So the incentive was to push to high SO2 so they would have the ability to compensate for these five or seven-day periods of shortcoming.

So I think it is as -- at least as much to make the systems work as it was for NSPS. And I say that having spent 15 years of my life at EPRI and those first

early three or four, five years working very close with the FGD engineers.

MR. AYERS: I had that kind of experience with the NSPS well. And my question would be isn't it true, despite what you said about the chemistry, that very few units installed at FGD before 1978 or '79, there are just very few installations?

MR. CICHANOWICZ: I actually had a number some place at one point in time. Few as a percentage of the inventory?

MR. AYERS: Yes. Below five percent?

MR. CICHANOWICZ: On that order maybe.

MR. AYERS: And then consequent to the NSPS, every new unit -- almost every new unit installed scrubbers; isn't that correct?

MR. CICHANOWICZ: Yes.

MR. AYERS: Thank you.

HEARING OFFICER TIPSORD: I have

about 12:25. And we are at question No. 40. So that seems to be a good breaking point for lunch. Let's come back at 1:30, please, a little before.

(Whereupon the proceedings in the above-entitled cause were adjourned until August 17, 2006, at 9:00 a.m.)

STATE OF ILLINOIS)
) SS:
COUNTY OF LAKE)

I, Cheryl L. Sandecki, a Notary Public within and for the County of Lake and State of Illinois, and a Certified Shorthand Reporter of the State of Illinois, do hereby certify that I reported in shorthand the proceedings had at the taking of said hearing and that the foregoing is a true, complete, and correct transcript of my shorthand notes so taken as aforesaid, and contains all the proceedings given at said hearing.

_____
Notary Public, Cook County, Illinois
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