BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED NEW 35 ILL. ADM. CODE 225 CONTROL EMISSIONS FROM THE LARGE COMBUSTION SOURCES (MERCURY)	)	RO6-25
	)	(Rulemaking - Air)

HEARING DAY EIGHT
(Testimony of James Staudt)

Proceedings held on June 21st, 2006, at 1:30 p.m., at the Illinois Pollution Control Board, 1021 North Grand Avenue East, Springfield, Illinois, before Marie E. Tipsord, Hearing Officer.

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HEARING OFFICER TIPSORD: Before -- After our break this morning, Mr. Zabel brought up some concerns about continuing the hearing on the record. And in consideration of a number of things, and with the idea that we really want to be done as much as possible with the Agency's testimony by Friday, we, the Board, has asked that Dr. Staudt and Dr. Hausman be presented now and that we -- to the extent that Mr. Nelson can help answer those questions, that Mr. Nelson remain with us. But I understand that Mr. Nelson has to leave by four o'clock or so?

MR. KIM: Yes.

HEARING OFFICER TIPSORD: Excuse me, we're back on the record. Gentlemen, gentlemen, we're back on the record. With that being said, one of the things that led to this decision was consideration of instead of continuing on the record or having new additional hearings between now and the scheduled August hearing, that what might be feasible is written responses to pre-filed questions and then follow-ups to be held in August.

And we sort of looked at Mr. Nelson's

testimony. We think some of Mr. Nelson's testimony and questions that -- that are being directed to him will profit by having his studies, which he has talked about in the record, and so we thought that might be the best use of hearing time through Friday. I'm not saying that's what we're definitely going to do, but that's sort of where we're leaning at this point.

So with that being said, we thought it best to go with Dr. Staudt and Dr. Hausman. Mr. Harrington?

MR. HARRINGTON: Does that mean we will have a chance to complete, at some point, the cross-examination of Mr. Nelson?

HEARING OFFICER TIPSORD: Absolutely.

MR. HARRINGTON: There's been several critical areas. His testimony this morning is very emphatic on certain points, which we obviously disagree strongly, and feel that differed also from Dr. Staudt's, so follow-up is very critical for us.

HEARING OFFICER TIPSORD: Absolutely. And I do not mean this in any way to cut off your ability to cross-examine or ask questions. Like

I said, we just thought that perhaps that it might be a better use of our time to go with Dr. Staudt and Dr. Hausman. And, yes, we will -- you will get the opportunity to finish questioning or follow-up with questions of Mr. Nelson, if at worst, the beginning of the August hearing.

MR. KIM: Yeah. That's fine. I say that without having talked to Mr. Nelson, but we will do the best we can to accommodate that. We'll talk very emphatically with him.

MS. MOORE: We're going to beg him to come.

MR. KIM: Yes.

HEARING OFFICER TIPSORD: And again, I just want to state, Mr. Nelson, we appreciate your testimony. We appreciate your comments and like -- we think that quite frankly we thought that your questions led themselves to best to answers as far as that they -- they follow-up with more so than -- than either Dr. Staudt or Dr. Hausman or quite frankly anyone else before you because partly that they asked you some more specific questions and these are more general questions. So I thank you very much for your

time and your testimony.

MR. KIM: So it's clear for the record, the modifications you're making is Mr. Nelson will provide written answers to the remainder of his questions that were submitted in pre-filed form, and to the extent it is needed or requested or desired, we would have follow-up of Mr. Nelson, if nothing else, at the outset of the Chicago hearing?

HEARING OFFICER TIPSORD: If we do not get to him -- Did you say you'd be back tomorrow, Mr. Nelson?

MR. NELSON: Yeah. If you can -- I'll be happy to stay until tomorrow if I could -- that way if there are cross-examination questions, then they can submit written questions, I'd will be happy to do that, written answers, but that does not give the opportunity to follow-up questions.

HEARING OFFICER TIPSORD: Right. We would make that accomodation at a later date.

MR. KIM: As far as that's the only modification we're getting into at this point?

HEARING OFFICER TIPSORD: Right.

MR. KIM: Would you like me to provide both Mr. Hausman -- Dr. Hausman and Dr. Staudt's testimony at the same time?

HEARING OFFICER TIPSORD: Let's do both. And let's swear in Dr. Hausman and Dr. Staudt. And, Mr. Nelson, remind you you're still under oath.

MR. HARRINGTON: Are we starting with Dr. Hausman or --

HEARING OFFICER TIPSORD: Dr. Staudt.

(At this point in time Dr. Hausman and Dr. Staudt were sworn.)

HEARING OFFICER TIPSORD: For the record this amended testimony of James Staudt is the amended testimony that was allowed by hearing officer order, correct, Mr. Kim?

MR. KIM: I'm sorry?

HEARING OFFICER TIPSORD: The amended testimony allowed is pre-filed testimony?

MR. KIM: That is correct. That is the most recent version of Dr. Hausman.

HEARING OFFICER TIPSORD: We will mark that as Exhibit No. 50 if there's no objection. Seeing none, congratulations, Dr. Staudt, you're

number 50. And the pre-filed testimony of Dr. Hausman, if there's no objection, we will mark that as Exhibit No. 51. Seeing none, it's marked as Exhibit No. 51. And to be clear, we are going to go to Dr. Staudt's questions now at whatever order of questions the Agency would like to begin.

DR. STAUDT: Well, I'll start with the Ameren questions. Question No. 1.

HEARING OFFICER TIPSORD: Excuse me, identify who you're starting with, please.

DR. STAUDT: I'm starting with -- This is Dr. James Staudt. I'm starting with questions from -- questions with James Staudt filed from Ameren. First question is, "Please describe your personal experience in the design, construction, and installation in major pollution control projects at coal-fired electric power plants."

My previous employers include Fuel Tech and Research Cottrell, who are both suppliers of air pollution control equipment to the electric utility industry. Research Cottrell sells a wide range of technology including electrostatic precipitators, fabric filters, NOx

control systems, SO2 control systems. And Fuel Tech is -- so primarily NOx control system.

At those employers I served in senior technical management role, involved in a number of electric utility projects in both the design and startup -- at those employers I served in senior technical management role.

Since starting Andover Technology Partners in 1997, I worked at several electric utility companies to help optimize an existing air pollution control systems, troubleshoot air pollution control systems and determine cost-effective approaches for pollution control, and I also have software and reports that I've developed that are sold to electric utilities. They are associated with selective catalytic conduction systems which are air pollution control technology.

In addition, during -- since forming my own business in '97, during that time I have assisted USEPA in analysis of cost and performance of pollution control systems for utility boilers.

HEARING OFFICER TIPSORD: Mr.

Harrington?

MR. HARRINGTON: The variety of roles for working in skills and I'm trying to --

HEARING OFFICER TIPSORD: Excuse me, Mr. Harrington. I'm not sure the microphone is on. If it is, could you move a little closer?

MR. HARRINGTON: Is that better?

HEARING OFFICER TIPSORD: Yes.

MR. HARRINGTON: The variety of roles and engineering -- environmental engineering, I'm trying to pin down, you know, where your expertise, particular expertise, do you -- have you done detail design of installations air pollution control installation for power plants?

DR. STAUDT: I have supervised detailed design of -- of the systems.

MR. HARRINGTON: Have you done the cost estimation for the actual installation of systems?

DR. STAUDT: Yes, yes.

MR. HARRINGTON: What kind of systems, may I ask?

DR. STAUDT: Selective non-catalytic reduction systems and selective catalytic

reduction systems.

MR. HARRINGTON: And was this for bidding purposes too?

DR. STAUDT: Yes.

MR. HARRINGTON: Have you personally supervised the installation of these systems?

DR. STAUDT: Yeah. Actually usually there was a project manager who took that role, but I was also involved in -- in providing input and supervision on the installation and startup. But the details of -- the details usually had a project manager who interfaced with the construction firms.

MR. HARRINGTON: Did that project manager report to you?

DR. STAUDT: Yes.

MR. HARRINGTON: Okay. No questions.

HEARING OFFICER TIPSORD: Question No. 2.

MS. BASSI: I have --

HEARING OFFICER TIPSORD: I'm sorry. Ms. Bassi.

MS. BASSI: I'm sorry. This is a -- this is a administrative thing. I thought

yesterday, or some day, sometime during these two weeks we were talking about Chris Romaine and Jim Ross being on the panel with Dr. Staudt. Did I -- do I remember that incorrectly?

HEARING OFFICER TIPSORD: Mr. Ross is at the back, so he is here. I understand that Mr. Romaine might be present if there were questions he needed to answer.

MR. KIM: We can go get him.

MS. BASSI: Okay. Well, as I was telling Mr. Kim earlier, I do have a couple of just very short, I promise you, specific questions that I -- one for Mr. Romaine and one for Mr. Kaleel sometime before the end of Friday, if we can accommodate that, please. Sorry to interrupt as well.

HEARING OFFICER TIPSORD: That's okay. Question 2.

DR. STAUDT: Question 2 is, "Prior to preparing your written testimony in this proceeding and your work on the technical support document, did you perform a detailed study of the existing coal-fired power plant in the State of Illinois?"

Well, during the course of this work the information has continually improved so starting from -- so -- so -- we've continuously have had better information. The -- When detailed -- In terms of the detailed study of the existing coal-fired powered plants, we did conduct a detail -- did conduct a detailed study all along and that over time our level -- our level of understanding of the equipment did improve, so, and that study was started well before the TSD.

HEARING OFFICER TIPSORD: Question No. 3.

DR. STAUDT: "Were you familiar with the size and design of electrostatic precipitators used on each of these facilities?" My question is: Is this in reference to the prior question which it says -- says on the date, you know, prior to preparing written testimony and the TSD?

MR. HARRINGTON: Both before preparing your -- the TSD originally and then as of now.

DR. STAUDT: Well, again, this is another situation where although -- while I --

when I initially started working on this program for the Illinois EPA, I had a general understanding of the situation in terms of ESPs and other -- and other matters, and it has significantly, you know, it's significantly improved over that time.

MR. HARRINGTON: Maybe for ease, are you familiar with the document which, I believe, has been marked Exhibit 44?

DR. STAUDT: I think so.

MR. HARRINGTON: Statewide Coal-fired Electric Utility --

DR. STAUDT: Yeah, I think it -- if it's what I think it is. That -- Yeah, I have seen this.

MR. HARRINGTON: Is this -- is this the document you relied on or are relying on as of this time for information about the utility?

DR. STAUDT: Well, this -- this and other information that it was the -- it was also the inspection reports.

MR. HARRINGTON: This and the inspection reports?

DR. STAUDT: And are you saying at

what point in time was I relying on this or -- or if you could give me a specific time?

MR. HARRINGTON: When you prepared the TSD, what information did you rely on?

DR. STAUDT: I had this information -- I had this information. And in addition to this information, there is data that's readily available from EPA on their NEEDS (phonetic) database and also the -- it's submitted as of tool emissions -- or submitted emissions levels for NOx and SO2.

MR. HARRINGTON: When you filed the shortcut, that's when you filed your final amended testimony, what data do you then have in your possession?

DR. STAUDT: Well, in addition I also had -- I also had this -- the information that you saw from -- you're aware of from the inspection reports.

MR. HARRINGTON: The inspection reports and version -- and Exhibit 44?

DR. STAUDT: Yes, and Exhibit 44.

MR. KIM: And the additional documents that we discussed, I don't think that we reached

a resolution as to how to handle, the -- This document that we handed out the other day entitled Control Configuration Inspections.

MR. HARRINGTON: Okay.

HEARING OFFICER TIPSORD: Is this the inspection report that we were just talking about?

DR. STAUDT: Yeah, that's what -- that's what I was referring to.

HEARING OFFICER TIPSORD: And this is the report you're still trying to figure out how to put in the public record?

MR. KIM: The last I recall discussion that -- that's where we left it, yes.

HEARING OFFICER TIPSORD: We really need to get that in however we can. And -- Well, never mind. Wait until we're off the record. I apologize for interrupting.

DR. STAUDT: We're at number 4, I think. "Is it not true that ESPs in Illinois facilities are typically much smaller than those in various studies referred to in the TSD?" The answer is in some cases -- in some cases, yes.

MR. HARRINGTON: Have you prepared any

chart or anything else that indicates to you which are larger and which are smaller between the two line for reference?

DR. STAUDT: No, I -- no, I -- well, we have the information -- the information from the inspection reports.

MR. HARRINGTON: So you're relying on the inspection reports for those description?

DR. STAUDT: That's what I'm relying on for the inspection reports for those descriptions, that's correct.

MR. HARRINGTON: But you don't have any separate document that you're relying on?

DR. STAUDT: I don't have a separate document that was -- that's been produced or -- or that I've obtained for that information. You mean associated with Illinois ESPs?

MR. HARRINGTON: Correct.

DR. STAUDT: Correct, yes.

MR. HARRINGTON: I would suggest that if we don't figure out how to enter the inspection reports themselves, something showing that data that Dr. Staudt was relying on would be useful for the record and for us, obviously, to

see whether it all got down correctly between various transmissions along the way if he doesn't have this latter one.

MR. KIM: We're certainly amenable to that as well.

DR. STAUDT: Number 6.

MR. HARRINGTON: I think we skipped 5.

DR. STAUDT: Oh, I'm sorry. "Were you familiar with the gas conditioning that is used on some of these facilities?" Again, the level of understand -- I was aware and I expected that SO3 conditioning was used at some of the facilities, but now as a result of the site inspections we have more detailed information on specific information.

MR. HARRINGTON: Did you take --

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

MR. ZABEL: Just so I can get clear the sequence of events --

HEARING OFFICER TIPSORD: Excuse me, Mr. Zabel. New court reporter. You need to identify yourself.

MR. ZABEL: Oh, I'm sorry. I'm

Sheldon Zabel. I'm representing Midwest Generation & Dynegy. Dr. Staudt, kind of sequence of events, you assisted in the preparation of the TSD; is that correct?

DR. STAUDT: That is correct.

MR. ZABEL: And you prepared your first round of testimony before you saw the inspection reports; is that correct?

DR. STAUDT: That is correct.

MR. ZABEL: And you prepared your second and third round of testimony after you saw the inspection reports; is that correct?

DR. STAUDT: That is correct.

MR. ZABEL: And did the inspection reports have an impact on the revisions that you made in your second and third round of testimony?

DR. STAUDT: Not -- not -- not a great -- not to a great degree.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: All right.

HEARING OFFICER TIPSORD: Ready to go onto question 6?

MR. HARRINGTON: Let me finish with 5.

Did you take the presence of gas conditioning, SO3 conditioning in particular, into account when you prepared the TSD, the portion of it?

DR. STAUDT: Well, I'm not sure if there's any reference to the gas conditioning in the TSD. I don't remember. I don't recall if I wrote -- if I wrote that in, but I did take -- I -- I don't have -- I don't believe I have a reference to SO3 conditioning in the TSD.

MR. HARRINGTON: When you reached the conclusions in the TSD as to the technology that would be required at the various individual facilities, did you take the presence of SO3 gas conditioning into account at that time?

DR. STAUDT: At the time of the TSD?

MR. HARRINGTON: Well, fine with --

DR. STAUDT: On my initial -- initial testimony. Could we read the question back, please?

(The Reporter read from the record as follows: When you reached the conclusions in the TSD as to the technology that would be required at the various individual facilities,

did you take the presence of SO3 gas conditioning into account at that time?)

DR. STAUDT: Yes.

MR. HARRINGTON: And how did you take it into account?

DR. STAUDT: The -- And I think we're going to go -- get into SO3 conditioning quite a bit of detail later so we can either explore that now and -- or -- or not.

MR. HARRINGTON: I'm looking particularly at the time you prepared the TSD in the original testimony. I believe you said you took the SO3 conditioning into account in reaching your conclusion?

DR. STAUDT: Yeah. I was aware that there was SO3 conditioning and also aware that there are alternatives to SO3 conditioning that can substitute for SO3. There's also -- You can also inject the sorbent upstream of the SO3 so that there is not an interference. And I'm not sure if Sid Nelson testified to that effect or not but he --

MR. HARRINGTON: We didn't get to that

point.

DR. STAUDT: Okay. But there's -- the -- I'm aware that Sorbent Technologies has run a test where they were able to address that.

MR. HARRINGTON: Did you take all that into account at the time the TSD was prepared or subsequently?

DR. STAUDT: Well, it's, you know, if trying to go back and remember specifically all the thoughts that were going through my mind when I wrote the TSD, but I was aware that SO3 conditioning was used at Illinois power plants, and I would not have reached the conclusions that are in the TSD without that consideration having -- having known that.

MR. HARRINGTON: We will come back to the current situation later, but let me proceed.

HEARING OFFICER TIPSORD: Question No. 6.

DR. STAUDT: "How familiar were you with the sources and chemical compositions of the coals that were consumed at these power plants, including the amount and types of mercury in the coals used at these plants?" As for the types of

coals, we had the -- originally the information -- I don't know what exhibit this is, the one you brought up earlier --

HEARING OFFICER TIPSORD: Exhibit 44.

DR. STAUDT: Exhibit 44. That provided information on the coals being used at the plants. In addition to that, as far as mercury content, there was information that -- data that was -- let me check my notes here -- Massoud Rostam-Abadi of the Illinois Geological Survey provided us information on the mercury contents of various coals used in Illinois, not just Illinois coals but PRB coals, and those provided my -- my understanding of the coals being used at Illinois power plants.

MR. HARRINGTON: Is that -- and is that the information that's contained elsewhere in the technical support document you received from the gentleman at the Illinois Geologic Survey.

DR. STAUDT: Well, it's referenced in the TSD, that data is referenced in the TSD.

MR. HARRINGTON: Was there separate data other than what's contained in the TSD that

you relied on?

DR. STAUDT: Yes. And that was one of the data that -- there was the presentation that he made, that POWERPoint presentation, and that's referenced in the TSD. And I know -- I know that was turned over -- that was given to, you know, the state, I think, should have posted that as a reference.

MR. HARRINGTON: We can proceed.

HEARING OFFICER TIPSORD: Question No. 7.

DR. STAUDT: Number 7, "Did you review engineering plans or drawings on these plants to determine the feasible locations for installing the types of technology recommended in your testimony and whether it would provide adequate reaction time prior to ESPS?" I did not have detailed engineering drawings, but later I had the information on the general dimensions of the duct work.

It is important to note that there is not a reaction time limitation with halogenated activated carbon sorbent injection. Halogenated sorbent performance is limited by mixing --

mixing and not by the speed of the chemical reactions. It's mixing that is the time-limiting step. This is because the chemical reactions associated absorption are much faster than mixing; therefore, if appropriate measures are taken to get the sorbent in good contact with the gas stream, less mixing distance is needed.

MR. HARRINGTON: Reaction time may be the wrong choice of words there. Is contact time important, the amount of time that the sorbent has to contact the gas for that molecule of mercury to contact the particle of sorbent?

DR. STAUDT: What matters is how well -- how well is the sorbent distributed and mixed in the gas stream. There are a couple of ways to do that. You can just inject it to the -- inject it with a single injector and hopefully if you have a very long duct, it will be long enough to get good mixing. But there are other ways if you -- if you have a grid or you could even have good mixing devices in the duct work, you can improve that mixing so that you don't need such a long duct -- long length so the -- there's not so much -- for any given situation, you can -- this is a

matter of you look at the circumstances, the type of duct work you have and you design the injection system to properly address that -- that particular situation because the reaction time is, you know, rather not the reaction time, but the time -- the distance and the duct work is a given with the plant, so you design the -- you design the injection system to address the circumstances you have in the plant.

MR. HARRINGTON: So if you have a short duct work within which to inject the material before it enters the ESP, then you might need a more elaborate system to inject it; is that correct?

DR. STAUDT: That is correct.

MR. HARRINGTON: Did you assume any such system for any other plant you considered in the TSD?

DR. STAUDT: Well, in terms of cost? I mean, I imagine you're in terms of cost?

MR. HARRINGTON: Cost, yes.

DR. STAUDT: Yeah, my assumption -- my assumption -- well, my assumption was a fairly simple assumption. Those -- And when you discuss

an elaborate system, the cost of these -- the hardware even with a more elaborate injection grid is not going to be a big part of the cost of -- is not going to be -- make a big difference in the cost of the system.

For these sorbent injections systems that are upstream of an ESP, the real cost is the sorbent, that that -- that the equipment becomes pretty unimportant on a relative basis.

MR. HARRINGTON: If you have to put mixing into the duct work, does that require an outage in the plant?

DR. STAUDT: If you -- Yes. If you have to go -- depending upon if you have to put in -- if you -- depending upon the type of equipment you need to install, yes, but usually such an outage would be fairly -- fairly short, And over a period of three years, I'm sure that -- that such an outage can be accommodated.

MR. HARRINGTON: At -- Neither at the time of the TSD or today, did you take any additional consideration of any additional costs associated with better mixing just --

DR. STAUDT: Well, I did not include

that in my -- in my estimates, but we're going to get to this. I know there's another question about, you know, perhaps my estimates on the capital costs are low, but I'm going to give you my answer now and we can repeat it later. You know, you can double or triple the capital costs on the sorbent, the assumed capital costs on the sorbent injection systems, and the effect -- the effect would be on the overall analyzed costs of control, it's really pretty much negligible because most of the cost -- most of the cost of this technology is associated with the sorbent that's injected.

The capital cost, as we discussed, the sorbent for a 500 megawatt plant, a sorbent injection system might cost on the order of a million dollars where if you double or triple that, maybe it's three million dollars. But relatively speaking an SCR might be 50 million dollars. A wet scrubber might be, you know, 100 million dollars. So the sorbent injection technology, even -- even if I'm off by a factor of three or four on the capital cost in the whole economic analysis, it makes almost no difference.

The cost is in the sorbent. That's it.

HEARING OFFICER TIPSORD: Question No. 8.

DR. STAUDT: "Over the past five years how much of your work has been done directly for the operators of coal-fired electrical generating units?" Perhaps in the range of about, you know, 20 percent. Can I go to question 9?

HEARING OFFICER TIPSORD: Yeah.

DR. STAUDT: "Over the last five years, how much of your work has -- oh, over -- how much of your work has been done for the suppliers of pollution control equipment and air pollution control supply such as sorbents?" Perhaps in the range of about 30 percent, maybe as high as 40 percent.

MR. HARRINGTON: And who else -- remaining portion of your work?

DR. STAUDT: A lot of it is for government USEPA.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Question No. 10. I'm sorry. Mr. Bonebrake?

MR. BONEBRAKE: Steve Bonebrake

representing Dynegy Midwest Generation. Have you done any work for Mr. Nelson's company?

DR. STAUDT: No, I haven't. 10, "Are there any other professionals with Andover Technology other than yourself?" There are no other full-time employees.

HEARING OFFICER TIPSORD: Number 11.

DR. STAUDT: 11, "Has or does Andover Technologies do work for a company called Sorbent Technology?" I've already answered that, and I don't. And 12.

HEARING OFFICER TIPSORD: Has been answered.

MR. HARRINGTON: 13 has been answered as well.

DR. STAUDT: 13, I think, is a repeat.

HEARING OFFICER TIPSORD: Question No. 14.

DR. STAUDT: 14, "How much of Chapter 8 of the technical support document were you responsible for writing?" I wrote most of it. And Illinois EPA made some comments and suggestions. "Did you prepare all the tables in Chapter 8?" I prepared most of them. I think --

I think all of them except for Table 8.2 is drawing from another source, but all of the rest are -- I think I prepared. 16, "Did you calculate the costs due to the impact of activated carbon injection on ash disposal?" Yes, I did. "Did you do the calculations in each of the tables in which it is referenced in the TSD?" And that would be correct.

In some cases there was data drawn -- some of the tables is data actually drawing from EIA Form 767 data. The power plants have to submit each year information about their operation. They get sent to the government. The government compiles that, and it's made available on the internet. The latest information is 2004, so I used the 2004 EIA Form 767 data for all the ash quantities. Question 18.

HEARING OFFICER TIPSORD: I'm sorry. Ms. Tickner?

MS. TICKNER: I just have one follow-up question. My name is Dianna Tickner with Prairie State Generating. You mentioned you used 767 to get the ash quantities. I'm curious why you didn't use it to get the coal quality?

HEARING OFFICER TIPSORD: I didn't hear the last part of that.

MS. TICKNER: Why he did not use 76 -- EIA 767 to get the coal quality that each of the generators reported to EIA?

DR. STAUDT: Well, first of all, this had already been put together, which saved me some work. Second, I'm pretty sure that -- that I was -- my understanding, and I believe I may be wrong, but my understanding is that this draws on the Form 767 data as well as the -- as well as other data basically.

HEARING OFFICER TIPSORD: Excuse me, Dr. Staudt. This, you're referring to as Exhibit 44?

DR. STAUDT: Exhibit 44, I'm sorry. I apologize.

MS. TICKNER: Maybe I'm confused. I thought you said you got the coal quality data from the Illinois Geologic Survey?

DR. STAUDT: No, I got the content of mercury --

MS. TICKNER: Okay. Thank you.

DR. STAUDT: -- from Illinois Geologic

Survey.

HEARING OFFICER TIPSORD: My question is, what is the -- is it EIA?

DR. STAUDT: EIA. Yeah, Energy Information Administration.

HEARING OFFICER TIPSORD: And what exactly is that? Is that a document or form?

DR. STAUDT: It's a -- it's something that each of the power plants submits each year to the Department of Energy. It's -- The data gets compiled, and it's downloaded on their Website on the internet. And so that's publicly available information and, you know, each of the power plants or -- they submitted the data, so they have it, all right.

HEARING OFFICER TIPSORD: No, we don't. Would it be possible for us to get that information in this record at least for the Illinois power plants or is that --

DR. STAUDT: Basically the table -- the table is drawn right out of the --

HEARING OFFICER TIPSORD: Which -- which table?

DR. STAUDT: The table in -- Go to the

TSD.

HEARING OFFICER TIPSORD: In the TSD?

DR. STAUDT: Yeah. The table in the TSD for -- that shows the data taken from EIA Form 767.

MR. KIM: I think 168.

HEARING OFFICER TIPSORD: 161, Table --

MR. KIM: 8.8.

HEARING OFFICER TIPSORD: -- 8.8?

DR. STAUDT: 2000 forms, Form 767 as far as my -- I did the calculated dollars per ton because what they do is they have a revenue line and then they have a tons line, and basically you divide one by the other to get your -- to get the ton.

HEARING OFFICER TIPSORD: Okay. Thank you. That wasn't clear from the record that the information was actually in our record, that's why we asked.

CHAIRMAN GIRARD: But could you submit the web address or where ever it is exactly you got the information.

DR. STAUDT: Sure. I would be happy

to do that.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: A related question. You were holding up Exhibit 44 and Exhibit 44 contains, I think for each plant, a summary of it's called fly ash information.

DR. STAUDT: Yes.

MR. BONEBRAKE: Is that information that's listed in Exhibit 44 under the heading "Fly Ash Information" is that taken from EIA 767?

DR. STAUDT: Can you tell me the page?

MR. BONEBRAKE: Just an example, I'm looking at page 2 which relates to the Crawford facility.

DR. STAUDT: I believe it is. I believe that's the same -- same information from Form 767.

MR. ROSS: And it says that.

HEARING OFFICER TIPSORD: You have to identify yourself for the new court reporter and use the microphone.

MR. ROSS: Jim Ross. The very first page of Exhibit 44 has the data sources by which

the exhibit -- the information was complied. And it does, in fact, state that the fly ash information came from EIA-767 which is the form Dr. Staudt has been referring to.

HEARING OFFICER TIPSORD: Thank you, Mr. Ross. And for the record, Mr. Ross is under oath and has been for two weeks.

DR. STAUDT: I'm not sure what question we're on.

MS. TICKNER: Just a follow-up. Is Exhibit 44 where you said you got the coal quality?

DR. STAUDT: Well, the information on the types of coals.

HEARING OFFICER TIPSORD: Dr. Staudt, you're turned away from the microphone.

DR. STAUDT: Oh. Yes, that's where I got information on the coal that's being burned.

MS. TICKNER: I guess I'm just confused. On the first page it says the principal coal supplier information was from plats coal bass database (phonetic) is that where the coal quality actually came from. It's not clear?

DR. STAUDT: Well, that's a better question for the Illinois EPA that put together this document. I don't know.

HEARING OFFICER TIPSORD: Mr. Ross, can you answer that question?

MR. ROSS: Probably. What was the question?

MS. TICKNER: Well, I believe Dr. Staudt said that the coal quality data actually did come from EIA 767 and -- but he was referencing Exhibit 44 which, I believe, is this document. And it says under here number 3 that the coal supplier information, the source data was plats coal bass database, that's where the quality also came from?

MR. ROSS: Yeah, I'm unclear on what you mean by coal quality. The plats coal bass database is something that we were given information or access to from the Department of Commerce and Economic Opportunity. And as it says here in the document, it provides the amount and type of Illinois coal, the source is utilized along with other -- that coal quality.

MS. TICKNER: Well, you would need to

know whether it -- Was it subbituminous?

MR. ROSS: That's -- Yeah, that's what I'm referring to as coal type.

MS. TICKNER: Okay. Well, that's not EIA.

MR. ROSS: The amount and type of Illinois coal, it says type of coal is whether they are firing subbituminous or bituminous coal. And that is in the plats coal bass database.

DR. STAUDT: Just to -- I may have said that I thought this was -- this was -- the coal data was from 767, but I don't know if -- apparently it's Illinois EPA, but this is what I -- Exhibit 44 is what I used for my role.

MR. ROSS: My understanding --

HEARING OFFICER TIPSORD: We lost all of that.

MR. ROSS: That's -- My understanding is the plats coal base database is semi-expensive. It's an expensive subscription service that they subscribe to.

CHAIRMAN GIRARD: Well, Mr. Nelson, I have a question. Did they give you a hard copy that you then extracted the data from?

HEARING OFFICER TIPSORD: Mr. Ross?

MR. ROSS: I would have to double check on that. I'm uncertain. I know that we sent -- staff actually went over to the DCEO headquarters here in Springfield and spoke with individuals, and then after that initial meeting they traded e-mails back and forth and information was provided to us as we requested it. So whether it was in the form of a disc or a hard copy or attached to an E-mail, I'm uncertain. I could certainly follow-up on that and get back to you.

CHAIRMAN GIRARD: So you're saying it's not in that the bankers box of extra documents we have?

MR. ROSS: No, I don't believe so.

CHAIRMAN GIRARD: It certainly would be good to have that in record. We need to have access to anything you looked at and put into writing. I mean, this is basic principle here. We need to be able to look at everything you used to come up with your proposal. So if there's other things out there, you need to be proactive and get them in the record.

MR. ROSS: I can follow-up on that. It is a subscription service. I don't think it would be any problem to print out the data that we used and provided.

CHAIRMAN GIRARD: That would be perfect. Thanks.

HEARING OFFICER TIPSORD: Mr. Zabel?

MR. ZABEL: Before we leave that, Mr. Ross, and before you go away, since we're on this, there's one entry I just don't understand and maybe you can explain it. Page 17 on the Baldwin plant.

HEARING OFFICER TIPSORD: Still with Exhibit 44?

MR. ZABEL: Yes, ma'am. If you look under principal cost supplier information, the very last column is entry for 2005, and I realize it's a partial year, but it only shows Wyoming coal at 85 percent and a total -- a total that's greater than the Wyoming coal supply, and I just don't understand those entries.

DR. STAUDT: They -- What was explained to me, I mean, I didn't put this together, but what was explained to me -- I had

the same question when I looked at this is there's -- they get -- they're able -- they have information on the major suppliers but this -- then there's other sources that they don't have information on. So it's kind of like other sources that are unaccounted for.

MR. ZABEL: I have no reason to doubt that explanation. It might have been clear on this table if there would have been another lines. 600,000 tons of coal is a fair amount of coal.

DR. STAUDT: Well, I should -- I had the same question when I looked at it.

MR. ZABEL: Thank you.

HEARING OFFICER TIPSORD: I think we're ready to move on then to Question No. 18. Mr. Harrington?

MR. HARRINGTON: If I could drop back for a minute to earlier discussion. On page 153 of the technical support document, Table 8.5 --

DR. STAUDT: Yes.

MR. HARRINGTON: -- is that the data you relied on for the mercury content of coal in doing your work?

DR. STAUDT: Yes, that is.

MR. HARRINGTON: Was there other data in addition to that that you relied on?

DR. STAUDT: For the --

MR. HARRINGTON: For the mercury content of coal?

DR. STAUDT: For the mercury content of coal, that is -- that is the information from that presentation that's presented there.

MR. HARRINGTON: That's the totality of it. There is -- We don't have to look someplace else for additional data?

DR. STAUDT: Not -- no.

MR. HARRINGTON: Okay. Thank you.

DR. STAUDT: Now in terms of the information I used, that's what I used.

HEARING OFFICER TIPSORD: Question No. 18.

DR. STAUDT: "With reference to the technical support document on page 115 it states, "effective capture in the range of about 90 percent appears to occur for all types of FGD when SCR is used combination with FGD." This is intended -- is this -- rather is this intended to

or imply that such applications will consistently achieve over 90 percent removal so to comply with the Illinois rule?" And did you hand these -- I don't know what this exhibit number is.

HEARING OFFICER TIPSORD: We haven't marked that as an exhibit. But we will do so now. Figures and data from the TSD, which Mr. Kim handed out earlier, we will mark as Exhibit No. 52 if there's no objection. Seeing none, this is marked as Exhibit No. 52.

MR. HARRINGTON: Before we go to the exhibit, could we have an answer to 18?

DR. STAUDT: Well, yeah. I'm going to use it as part of my answer, okay. If you -- The statement on page 115 that your -- the question refers to, it's made in reference to field test data shown on page 116 on Figure 8.3 and if you look at --

HEARING OFFICER TIPSORD: Microphone.

DR. STAUDT: -- if you go to the exhibit, Figure 8.3, the first figure that shows up, and so that statement is written in reference to data that is shown on page -- the statement on page 115 is written in reference to data on page

116. So it's not in reference -- it's not written in reference to the Illinois rule.

Now to look at -- I show the Figure 8.3 for your -- we talked about co-benefit reductions, what this shows comparison for different types of systems, it shows that with the type of mercury removal that Wet FGD technology has been able to achieve in some cases with an SCR and other cases without an SCR, and the white bars are without the SCR and the red bar is with the SCR in service, so my statement is in reference to that, you get about, you know, this data shows that you get about 90 percent removal, so that's what the statement is in reference to. It's in reference to this data. I'm just referring to the data.

HEARING OFFICER TIPSORD: And for the court reporter you tended to run together that's Wet FGD technology.

DR. STAUDT: And for co-benefit removal, when we talk about co-benefit removal, that's the removal that's provided by other air pollution control technologies that are not specific to mercury. And I know we're going to

be talking about a lot of different things here but for the sake of time, I want to keep my answers short. But just for the benefit of you folks, if there's any concept that comes up, term, please ask, I'll be happy to explain.

HEARING OFFICER TIPSORD: Trust me, I think you'll get asked.

MR. HARRINGTON: And I would ask the same thing with respect to my questions or follow-up questions. If I say an abbreviation or misuse abbreviations, I will be happy to explain.

HEARING OFFICER TIPSORD: I think I hold the record on misusing abbreviations so far.

MR. HARRINGTON: So the question -- is the question -- answer to 18 yes or no?

DR. STAUDT: No. It's not intended to imply that. It's in reference to the data on page 116.

MR. HARRINGTON: Okay. Thank you. Since we're looking at that data now, I have a couple of questions if I may. Is -- Do you know whether this data and your conclusions you've drawn from it take into account uncertainty in mercury measurements for the gas and coal in --

and coal?

DR. STAUDT: Well, to the best of my knowledge these were -- these were tests sponsored by the U.S. Department of Energy. And so to the extent that we have confidence in their ability to supervise these tests, I would say yes.

MR. HARRINGTON: No matter how well they supervise the tests there is an errant variability in the sample; is that correct?

DR. STAUDT: I can't -- I can't -- I'm not an expert on sampling. I'm an expert on control technology, so -- so I can't comment on details on coal sampling.

MR. HARRINGTON: Just for the record, I know it is in evidence, but as I look at Figure 8.3 I see several of the red bars not reaching 90 percent removal level, am I correct?

DR. STAUDT: That's -- that's correct. You see some below; and you see some above.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: A related question.

Figure 8.34 is entitled "Mercury Removal By Wet FGD - Technology with and without SCR," the statement from your report on page 115 reflected in question 18 seems to refer to all types of FGD, and I was wondering am I misreading Figure 8.3, or is there some other data that you are relying upon with respect to Dry FGD technology?

DR. STAUDT: The -- on the right SDA stands for Spray Dryer Absorber and that is Dry FGD. So those two -- the two right bars to the far right. That's -- Yeah. The title is misleading.

HEARING OFFICER TIPSORD: Actually the SDA --

DR. STAUDT: SDA is a dry -- is a Dry FGD actually.

HEARING OFFICER TIPSORD: I believe you said the two white bars were correct.

DR. STAUDT: The two red bars on the far right. I'm sorry.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: So then should -- should this Table 8.3 or Figure 8.3 be amended so that word wet is taken out of the title, is that what

you were saying?

DR. STAUDT: Perhaps it should be amended to say the title of the figure should just be FGD technology perhaps.

MS. BASSI: Why do you say perhaps?

DR. STAUDT: Well, okay, yes. Score one for you.

MS. BASSI: Well, it's not a competition. It's -- I want to know.

HEARING OFFICER TIPSORD: Mr. Zabel?

MR. ZABEL: I have one to follow-up. Dr. Staudt, the SDA, the Dry FGD, I'm going to try to read the acronyms right, are both of those equipped with fabric filters?

DR. STAUDT: I believe those were -- those two tests were spray dryers with fabric filters, yes.

MR. ZABEL: Thank you.

DR. STAUDT: And these are all bituminous coal, I believe.

MR. ZABEL: Thank you again.

HEARING OFFICER TIPSORD: Ready for question 19?

DR. STAUDT: "Page 119 of the

technical -- page 119 of the technical support document states some of the bituminous coal-fired boilers may not achieve adequately low mercury emissions --

HEARING OFFICER TIPSORD: Excuse me. Let me interrupt you. I appreciate that you need to confer, but the court reporter is sitting next to you guys and she's having trouble hearing. We may look at moving her around later but for now, go ahead, Dr. Staudt.

DR. STAUDT: "Page 119 of the technical support document it states "Some of the bituminous coal-fired boilers may not achieve adequately low mercury emission by co-benefits alone. Therefore, these plants may need additional controls to achieve the levels of mercury removal that are being required in the proposed rule." Which if any Illinois plants do you believe would require additional controls to comply with the rule of mercury -- with the rule of mercury removal beyond flue-gas desulfurization and selective catalytic reduction?"

And there are unscrubbed bituminous

coal-fired units such as Meredosia that are not expected to get anywhere close to 90 percent removal through co-benefit reduction with co-benefit. And as I noted earlier, I expect those bituminous units with SCR and FGD will achieve close to 90 percent for the Alpha-based standard through co-benefit. Based upon the information I have at this time I can't determine which, if any, units with SCR and FGD may require additional removal beyond co-benefit.

MR. HARRINGTON: May I follow-up?

DR. STAUDT: 20 --

HEARING OFFICER TIPSORD: Wait. Mr. Harrington had a follow-up.

MR. HARRINGTON: Let me make sure I'm looking at the right chart this time. Am I correct on Table 8.9 -- strike that. Thank you.

HEARING OFFICER TIPSORD: Question 20.

DR. STAUDT: "What additional control would be required?" The -- It's really up to the owner to decide what controls may be needed. Sorbent injection is only one option. I expect that owners of scrubbed units might pursue other approaches first such as possible optimization of

scrubber chemistry or injection of oxidizing chemicals. Other approaches also include improving the co-benefit removal associated with the particulate removal device. Because all of those -- most all the units in Illinois have that -- that are -- that are scrubbed also have ESP so they could potentially also improve the co -- the amount of co-benefit from the ESP.

And just as far as discussing oxidizing chemicals, the Figure 8.4 shows a configuration shows how oxidizing chemicals, you have the boiler on the far left, you see there's an SCR. The SCR has the effect of it tends to oxidize the mercury -- that's in the element of mercury, it's in gas. Then there's the ESP, particulate control device. Then you can potentially put an oxidizing catalyst there under development or other oxidizing chemicals immediately upstream or into the wet scrubber. So there are a couple of different -- there are lots of different scenarios that people might pursue.

HEARING OFFICER TIPSORD: And for the record, Dr. Staudt, that was Figure 8.4 of the

Department's exhibit?

DR. STAUDT: Yes.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Are those technologies presently proven, the additional technologies you just referred to?

DR. STAUDT: Could you -- could you define for me what your criteria for proven? Could you specify a criteria for proven?

MR. HARRINGTON: Are they actually in commercial operation in power plants today?

DR. STAUDT: Well, it's kind of interesting, if all of these -- if these mercury control technologies were in commercial operation, I don't think we would be here today. But people do install the mercury controls until -- until it's a requirement or rule that forces them to.

MR. HARRINGTON: Are you aware of what testing has been done on each the technologies you just referred to.

DR. STAUDT: Yes, I'm aware -- I don't know that I'm aware of all the testing that's

been done, but I'm aware there's been a fair amount of testing that's been done.

MR. HARRINGTON: Are those technologies presently commercially available?

DR. STAUDT: To the best of my knowledge some of them are.

MR. HARRINGTON: Are those that are commercially available been demonstrated in conjunction with the FGD and SCR to achieve consistency over 90 percent removal?

DR. STAUDT: If you could specify what you mean by consistently? Give me a criteria.

MR. HARRINGTON: Consistently so that they would comply with the 90 percent removal requirement in the Illinois regulation?

DR. STAUDT: Yes, they have.

MR. HARRINGTON: And where is that?

DR. STAUDT: Dominions Mt. Storm plant is one. There are other plants as well.

HEARING OFFICER TIPSORD: Excuse me. I think Mr. Nelson has something to add.

MR. NELSON: Actually, Mr. Porter.

HEARING OFFICER TIPSORD: Identify yourself again.

MR. PORTER: David Porter. There is question that was there a guarantee on oxidization catalyst, and it's Cormetech actually has one. It's on our Website.

DR. STAUDT: Okay. Or part of a question.

HEARING OFFICER TIPSORD: Cormetech?

MR. NELSON: Sid Nelson. Cormetech, they are a major SCR catalyst producer --

HEARING OFFICER TIPSORD: Could you spell it, please.

MR. NELSON: C-O-R-N-E-T-E-C-H, Cornetech [sic]. It's a Corning & Glass and Mitsubishi adventure.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: When you were referring to oxidizing catalyst, which are identified on Figure 8.4, I think you used the term "in development" to describe such catalyst. Can you describe for us what you mean by "in development"?

DR. STAUDT: Well, I've seen tests of them but I've just seen tests -- I've seen the

results of testing. And I'm not -- I'm not aware that they are being offered commercially at this time.

HEARING OFFICER TIPSORD: Mr. Harrington and then Ms. Tickner?

MR. HARRINGTON: Are you aware of what coals are burned at the Mt. -- Dominions Mt. Storm plant?

DR. STAUDT: Those are bituminous coals.

MR. HARRINGTON: Are those high sulfur eastern bituminous coals?

DR. STAUDT: To my knowledge, yes.

MR. HARRINGTON: Do you know what methods we used at that facility for the tests that were referred to?

DR. STAUDT: They did have continuous mercury monitors, but again, this is another DOE -- this is also -- I received sponsorship from DOE so there was quite a bit of -- DOE usually has pretty extensive requirements on quality control for data.

MR. HARRINGTON: Are you aware there was one short-term stack test?

DR. STAUDT: Excuse me. One short-term stack test?

MR. HARRINGTON: That demonstrated a --

DR. STAUDT: There was a -- the testing was -- was run with the -- with continuous analyzes over -- over a period of time. It wasn't just -- there may have been a single extractive stack test, but there was data collected over an extended period of time using continuous analyzers.

MR. HARRINGTON: Do all of which demonstrated over 90 percent removal?

DR. STAUDT: We -- Over the period of time tested, yes.

HEARING OFFICER TIPSORD: Ms. Tickner?

MS. TICKNER: I'm just confused a little bit. If we go back to Figure 8.4 the location where, Dr. Staudt, you're showing the oxidizing catalyst after the PM control and I think Mr. Porter just mentioned the Cormetech catalyst which actually goes in the SCR, aren't we really talking about two different things here?

DR. STAUDT: What this shows -- Let me just clarify. Figure 8.4 shows a full range of -- a full range of possibilities, not specifically what Cormetech -- Cormetech is a -- is primarily an SCR catalyst supplier. To my knowledge they -- I know they're working on mercury oxidization for SCR catalyst and that would be the SCR catalyst. I don't know that -- I don't know whether or not Corning offers -- Cormetech offers an oxidization catalyst that would be downstream of the PM control device. I'm not aware of that.

MS. TICKNER: Okay. I just want be to be clear. He was talking about something totally different than --

DR. STAUDT: Than the oxidizing catalyst, right, yes.

MS. TICKNER: Okay.

HEARING OFFICER TIPSORD: Mr. Porter, did you have anything else to add to that?

MR. PORTER: I was just going to say that Jim is correct, that you could put the catalyst --

HEARING OFFICER TIPSORD: Hold the

microphone up.

MR. PORTER: -- configuration and Cormetech is doing -- is guaranteeing the oxidization catalyst. Now where it's actually located will be up to the individual facilities to make a determination how it works. They're also working on different formulations of catalyst that deal with other things like SO3 and things like that that Sid Nelson has already discussed. So there's a number of different catalyst formulations out there considering we had -- had our first catalyst in the country in the late '90s basically.

HEARING OFFICER TIPSORD: Mr. Forcade?

MR. FORCADE: Would it be all right if we reserved the right to ask Mr. -- Dr. Staudt tomorrow questions about the Dominion plant after we've checked tonight and find out the exact makeup of the plant, the dates of the test since we don't have it at our fingertips right now?

HEARING OFFICER TIPSORD: Fine with me, yeah. Are we ready then to -- Mr. Harrington, do you have any follow-up?

MR. HARRINGTON: Hopefully one.

You're familiar, Doctor, are you not, with the sampling methods and the details of the Illinois regulation?

DR. STAUDT: Not the sampling methods. I'm not a sampling -- I'm not a coal sampling expert. I'm an expert in control technology.

MR. HARRINGTON: Well, when you say -- I think you said you felt that there were techniques that would achieve compliance with the Illinois rule using co-benefit plus other things you mentioned. I'm wondering if you took into account the sampling analytical methods in averaging methods specified in the Illinois rule?

DR. STAUDT: Well, I certainly took into consideration the averaging. It's a 12-month average so variability typically -- while there may be variability on a day-to-day basis, that usually -- that gets averaged out pretty well. That's one of the reasons why power plants in general would much prefer a 12-month average to a one-hour average. And I can't imagine that the power plants here would be -- would feel equally -- would prefer a one-hour average to a 12-month rolling average. So that's

-- the 12-month average would address large -- a large part of the variability that you see.

MR. HARRINGTON: I'm trying to -- I'm not trying to pin you down to answer a question outside of your expertise. I'm just trying to make sure we understand how far that expertise goes. In this case am I correct you're not an expert in sampling or analysis and you're not -- you're not saying whether the method in Illinois rules for sampling and analysis will properly reflect the removal rates that will be achieved with co-benefit with whatever improvements you have?

DR. STAUDT: Yeah. I cannot speak to the co-measurement analysis methods that you're referring to.

MR. HARRINGTON: Can you speak to the flue-gas mercury measurements?

DR. STAUDT: I'm not -- I'm not a mercury CEM measurement expert either.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Mr. Nelson, you have something to add?

MR. NELSON: I have -- I do have some

experience in supervising multiple kinds of mercury analysis. If you have particular questions, I'd be happy to try.

MR. HARRINGTON: No, I'm just -- my questions have been answered in terms of expertise.

DR. STAUDT: There's another aspect to this is that utilities have a choice between the mercury reduction, percent reduction requirement or an output based standard, and if they comply with the output based standard, the -- there really isn't a need to be measuring the unit of coal.

MR. HARRINGTON: That still is based on the accuracy and reliability of the flue-gas measurement; is that correct?

DR. STAUDT: Yes, to the -- Yes. Which are consistent with what EPA requires.

MR. HARRINGTON: And are you aware of what the accuracy of those methods are?

DR. STAUDT: No.

MR. HARRINGTON: Are you aware what the flue-gas concentration would be with a facility complying with 0.008 pounds per million

to go out in power?

DR. STAUDT: Off the top of my head I couldn't tell you that.

MR. NELSON: If I --

DR. STAUDT: That's something that could be calculated.

MR. HARRINGTON: I'd like to direct my questions to -- unless Mr. Nelson is going to be qualified as an expert in flue-gas sampling.

HEARING OFFICER TIPSORD: We'll stick with Dr. Staudt at this point. Thank you. Ready for question 21?

MR. HARRINGTON: Yes.

DR. STAUDT: "Table 8.9 indicates that Duck Creek, Dallman, and Marion would achieve compliance with the Illinois rule through co-benefit. On what do you base that statement?" Well, Table 8.9 is a table that shows cost estimates. It's not a statement. So just to clarify that there's no statement in Table 8.9 and it's a table and it is associated with how people might -- might control.

It's my expectation that these units are close to compliance with the mercury emission

requirements at this time due to co-benefit, if not already a compliance.

MR. HARRINGTON: Am I correct that you just said that the technologies listed in Table 8.9, for example, technology and cost are -- are not your opinion that those technologies will, in fact, achieve compliance?

DR. STAUDT: You basically said that you -- I'm just talking about the wording of your question.

MR. HARRINGTON: Okay.

DR. STAUDT: Okay.

MR. HARRINGTON: Let's -- I understand there may have been some error in my wording but --

DR. STAUDT: There isn't a statement there that says that, okay. There's a table here and the table associated with how -- what the table is associated with is how I estimated the total cost of the rule. And when I put -- put co-benefit for those -- for those units, essentially I meant -- what my intention was to say that they are -- it's -- it's my expectation that if they are not already in compliance with

the rule, they are very close and the cost would be pretty small. So Table 8.9 is associated with how I developed a cost -- the cost of compliance with the mercury rule.

MR. HARRINGTON: With respect to Table 8.9, is it your opinion the technologies listed there would achieve compliance with the Illinois rule?

DR. STAUDT: With the exception of Meredosia -- the small units at Meredosia, while they would achieve compliance -- with the exception of the small units at Meredosia and potentially Hutsonville, if they -- if they continue to burn high sulfur coal, those ones I think would -- would comply through a TTBS, at least initially. The rest, I believe, the technology specified would be able to bring these units into compliance with the emission standards of the rule.

MR. HARRINGTON: Thank you. That's my understanding of the opinion. That's all I was trying to do.

DR. STAUDT: Okay.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Question No. 22.

DR. STAUDT: "Have you reviewed the data with respect to Duck Creek, Dallman, and Marion to reach a professional conclusion that co-benefit alone will be sufficient to achieve compliance with the proposed Illinois regulation?" And, you know, I reviewed information on these units. You know, as mentioned earlier, based upon information I have at this time, and you're aware of the information, I, you know, I cannot determine if any units with SCR and FGD will require additional removal beyond co-benefit, but I believe those units -- I believe that those units will be able to achieve compliance through co-benefit, or if there's any additional requirement, any additional need, it would be a relatively low cost.

MR. HARRINGTON: I call your attention to page 155, the paragraph immediately above where it starts with an introductory sentence above the bullet point in 155 of the technical support document.

DR. STAUDT: Okay, 155. Which paragraph?

MR. HARRINGTON: Paragraph -- that's the second full paragraph the sentence starts "the units that are assumed".

DR. STAUDT: Yes.

MR. HARRINGTON: Do you wish to amend that statement?

DR. STAUDT: Let me -- let me read this. I don't see a need to -- I don't see a need to -- Let's see. Those -- I don't see a need to revise that.

MR. HARRINGTON: Okay. Thank you.

HEARING OFFICER TIPSORD: Question 23.

DR. STAUDT: I believe --

MR. HARRINGTON: I believe that's been answered.

DR. STAUDT: Yeah.

HEARING OFFICER TIPSORD: Okay.

DR. STAUDT: Page 118 of technical -- 24, "Page 118 of the technical support document --

HEARING OFFICER TIPSORD: I'm sorry. Mr. Zabel?

MR. ZABEL: If I could go back to your answer concerning the statement on page 155, you indicate that you didn't think that they would need to?

DR. STAUDT: Didn't need to what?

MR. ZABEL: Install additional -- install SCR at the Dallman, Duck Creek, and Marion units?

DR. STAUDT: They may not have to. My basis is that they won't have to.

MR. ZABEL: But if they didn't, and in fact, didn't meet 90 percent, they'd be in violation of the proposed rule, would they not?

DR. STAUDT: Well, I would -- my -- my -- what they -- what I would do is have the time to figure out whether or not they are -- are at 90 percent, and if they are at that 90 percent already, then they would -- then they would do -- take some kind of precaution, do something, might be sorbent injection or something less in order to get -- get to either the 90 percent or the Alpha-based standard.

MR. ZABEL: And that would be determining compliance on the current operational

mode, fuels, etc.; is that correct?

DR. STAUDT: That -- Well, based upon -- yeah, their current operating mode and fuel, that's correct.

MR. ZABEL: And if something changed and they dropped to 89 percent, they would be in violation, wouldn't they, a 12-month rolling average I understand?

DR. STAUDT: Well, it depends. They can -- there is an averaging provision that they can do that if they drop to 89 percent.

MR. ZABEL: Assuming they could average and they averaged 89 percent, they couldn't buy an allowance to correct that one percent error, could they?

DR. STAUDT: Well, allowance trading is not permitted under the rule.

MR. ZABEL: Thank you.

HEARING OFFICER TIPSORD: Question 24. Oh, I'm sorry. Mr. Nelson?

MR. NELSON: But the -- in the first phase, for a good number of years the bubbles -- the whole utilities, so they only have to get 75 percent, correct, and the plant -- all the plants

together have to get 90.

MR. ZABEL: For Marion, Mr. Nelson, do you know what constitutes the whole facility?

MR. NELSON: Not for Marion, but --

MR. ZABEL: So they have the same problem, 89 percent they're in violation; right?

DR. STAUDT: Just if -- I think they get to average, don't they, get to average with the -- average with Kincaid and there's a pool.

MR. ZABEL: In the first phase and if they're the first one in the door; correct?

MR. NELSON: That's for the TTBS.

MR. ZABEL: You're right. I apologize.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: With regard to this averaging though among the pool of orphan units or orphan plants, is it not the case that there has to be some sort of agreement among those plants even though the Agency would not be a party to that agreement?

HEARING OFFICER TIPSORD: Introduce yourself.

MR. ROMAINE: Chris Romaine. Yes,

there would have to be such an agreement between the different companies.

HEARING OFFICER TIPSORD: And Mr. Romaine is sworn in. All right. Ready to go to question 24 then?

DR. STAUDT: At page 118 of the technical support document it states that what FGD additives are -- at what -- 118 of the technical support document I think you meant Wet FGD, not what FGD.

MR. HARRINGTON: I think so.

DR. STAUDT: Yes. Wet FGD additives are successful in improving mercury removal and by implication achieving compliance with the Illinois regulation. At what facilities has this been demonstrated? And the -- It's been done at a number of facilities just -- again, you saw Figure 8.4. This is a pretty active area. Babcock & Wilcox, which is a company that builds boilers and flue-gas to sulfurization systems, they're very active. And their approach has been tested at the Dominions Mt. Storm plant, LG & E, Mill Creek as well as Babcock & Wilcox's large boiler stimulater. They're have been other tests

as well some -- but some of these were not on limestone forced oxidation units, which are the type of technology that is used here in Illinois.

It's also my understanding that other companies I think Frontier Geosciences have also developed scrubber chemicals that are being testing. EPRI has been testing additives to improve scrubber capture at other plants, and they've been tested at TXU's Monticello plant and Minnkota Powers Young Plant. You know, the whole area here is not limited to what I -- there are things -- there are other tests that I'm sure I may not even be aware of. So there's been a fair amount of activity in this area.

MR. HARRINGTON: Were these all short-term tests?

DR. STAUDT: Could you tell me what you mean by short term?

MR. HARRINGTON: 30 days or less?

DR. STAUDT: I believe the Mt. Storm test went for -- went for quite a while and Mill Creek may have gone for a couple of weeks. And they were other tests on -- I think on some magnesium enhanced lime units that went for a

while too.

HEARING OFFICER TIPSORD: I have to ask you the same question. Could you define a while?

DR. STAUDT: For -- Anywhere from a few weeks to a few months.

HEARING OFFICER TIPSORD: Thank you. Go ahead, Mr. Harrington.

MR. HARRINGTON: Excuse me. Do these tests demonstrate over 90 percent removal with these systems.

DR. STAUDT: Yes. Well, certainly at Mt. Storm. At LG & E's Mill Creek, they had 84 percent across the scrubber, but if you would add to that the co-benefit of the -- of the -- of the ESP, and so these -- which would -- which would probably -- which would probably end up being 90 percent. I don't know what -- I don't know what the co-benefit was at that plant for the ESP because they just didn't show the data.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Question, Mr. Zabel?

MR. ZABEL: What were the fuels used

at those plants?

DR. STAUDT: Those were -- at LG & E's Mill Creek and Dominions Mt. Storm, those are high sulfur eastern coals. TXU'S Monticello is Texas Lignite. It's a tougher -- it's actually on those plants because on those types of coal, western coals, because they don't -- they produce primarily elemental mercury which a wet scrubber is not good at catching. So the oxidizing chemicals are used to -- to convert that elemental mercury to oxidized mercury which the wet scrubber is much more effective.

MR. ZABEL: A dry scrubber would have the same problem? That's the question.

DR. STAUDT: A dry scrubber on a western coal?

MR. ZABEL: Right.

DR. STAUDT: Yeah. A Dry FGD on western coal, by itself, it can get some removal but it's -- I would not necessarily expect it to get 90. But what they do is with the dry -- there are ways to do it with dry scrubbers that have been shown with the oxidizing chemicals or with the halogenated sorbent.

HEARING OFFICER TIPSORD: Question No. 25.

DR. STAUDT: "With respect to injection of halogenated activated carbon we call your attention to Figure 8.10 of the technical support document. Does that demonstrate that removal at or about 90 percent with some below and some slightly above was achieved for halogenated activated carbon injection prior to the ESPs? Were not all of those tests based upon a 30-day period?" Just go back to this.

MR. HARRINGTON: Page 127.

HEARING OFFICER TIPSORD: Thank you, Mr. Harrington.

DR. STAUDT: I know it's -- where is that -- the exhibit -- if you go to -- if go to the next page of the exhibit actually.

HEARING OFFICER TIPSORD: Exhibit 52.

DR. STAUDT: Exhibit 52. First, I think it's worthwhile for you to look at the arrangement for a typical sorbent injection system just so you know what we're talking about at Figure 8.6. The Figure 8.10 document refers to injection of sorbent upstream of an ESP shown

similar as in Figure 8.6, where the boiler on the left there's an ESP system now -- when you see TOXECON 2 in that dash line, forget about that. We're not going to talk about that. We're mainly talking about injection upstream of an ESP. The sorbent gets sent then upstream of the ESP, captures the mercury that's in the gas phase and that sorbent is then captured in the ESP. And then the gas goes out of the ESP and up the stack.

Figure 8.8 is just to show you the equipment, what it looks like. You can see on the left there's a duct coming from the boiler. The big building in the middle is the big Spray Dryer Absorber. It's used for SO2 control and then the big -- the smaller builder but pretty good sized on the right is the fabric filter. There's two ways of capturing particle matter. One is an ESP where you charge the particles and the charged particles get attracted to collection plates, tall plates that have -- and they get attracted to these collection plates. A fabric filter is -- think of it as a gigantic vacuum cleaner, okay. The gas gets pushed through a

fabric or a bag gets caught there and that's how the particles are collected. So that's what a fabric filter is. Most of the -- Mainly what we're talking about here in Figure 8.10 is injecting the sorbent upstream of an ESP.

I wanted to give you that because we're going to -- you go -- if we go two -- go back two pages, you've got Figure 8.10, which is what the question refers to. You know, Figure 8.10 and Figure 8.11 of the TSD shows test results from various sorbent injection tests. The figures show the percent mercury removal contributed to sorbent injection, that is over and above that of co-benefit removal versus the injection concentration measured in terms of pounds of sorbent per actual -- million actual cubic feet of boiler exhaust gas. So basically when it's concentration, it's how many pounds per volume of gas passing the -- through the duct. So I guess the total sorbent injection to the gas you multiply the injection rate, or whatever percent reduction you're looking for, times the volume of gas and you get how many pounds per hour sorbent you need to inject.

Figure 8 -- on Figure 8.10, two data points represent 30-day tests. Sorry. I'll get closer to the mike.

HEARING OFFICER TIPSORD: Also you need to speak a little slower. That's the problem. You're actually running together more than not being able to hear.

DR. STAUDT: Sorry.

HEARING OFFICER TIPSORD: That's okay.

DR. STAUDT: There are two data points that represent 30-day tests and those are the ones that are circled. The rest are results from parametric tests. Parametric tests may have run for a few days or for a few weeks. And what the intent of parametric test is, you want to see how much reduction you get at a particular injection rate. It's kind of like, you know, how fast you go for a certain amount of gas that you put in the engine for your car. You want to -- The more -- you put in more sorbent, you catch more mercury. So it's not surprising that some of these results are under 90 percent because they are intended to see how -- how the system responded to different injection rates, but the

two 30-day tests were above 90 percent removal.

The other data points are from parametric tests, and the intent was to vary it so you do see some results under 90 percent. So these test results shows expected that the lower treatment rates less -- that lower treatment rates less mercury removal is possible. At a higher treatment rate, higher mercury removal is possible.

And on this test only one full scale test on the data shows -- was not capable of achieving 90 percent at 3 pound per million ACF but it did for five. And that was the Stanton 1 data which is a lignite coal not a PRB coal, which is somewhat more difficult, okay, so we would expect it to be a little higher.

MR. NELSON: If I can interrupt and update a little bit on Stanton 1. Another company, URS, in the fall ran a 30-day test at Stanton 1 with subbituminous coal. The coal that is mostly here in Illinois, burned in Illinois. They weren't trying for 90 percent. They used our sorbent for 30 days, and they injected it an average injection rate of 1.6 pounds, so you can

put a little "X" if you go 1.6 they averaged 81 percent above your curve that that Stanton 1, 81 percent at 1.6 pounds per million cubic feet.

DR. STAUDT: Now just draw your attention to the --

HEARING OFFICER TIPSORD: Excuse me. Mr. Harrington?

MR. HARRINGTON: Mr. Nelson has added testimony here. I just want to ask one quick question. What was the SCA on the Stanton unit?

MR. NELSON: I do have that. Give me a second.

HEARING OFFICER TIPSORD: It's working but you have to hold it right up to your mouth. It's a directional microphone.

MR. NELSON: Stanton 1 plant it was 470 square feet per thousand actual cubic feet per minute of gas.

MR. HARRINGTON: Thank you.

DR. STAUDT: I just want to draw your attention to just below that. What I've done is I've taken the full scale PRB data from Figure 8.10 and below that I've applied it in a different way. And this is helpful in the -- Sid

testified earlier that about plotting these things in a logarithmic fashion engineers and scientists like to -- sometimes like to plot some data on a semi log because some things in -- some things in nature behave that way and you don't get straight lines. Most people don't like it, don't think that way in the semi log -- in logarithmic way, but hopefully this will help you.

What happens is I've applied the log to the base 10 up to a fraction of mercury remaining, so minus one refers to -- if you remember back, it's equal to 10 to minus 1 or 10 percent, which is the same as 90 percent removal. And so what I showed there I plot the data. You see the red line shows where 90 percent reduction is, and it also -- there's a, you know, at best a curve. So you get a fairly straight line for this data and it does get below 90 percent at adequately high treatment rates at about 3 pound per million ACF or more.

I did the same thing with Figure 8.11. You go to the next page. There's a little more scatter with -- with the -- and this is the

bituminous coal. I also added data from DTE Monroe which is 60 percent bituminous, 40 percent PRB and has similar SO2 levels as some of the Illinois bituminous units we have here. And you can see that also plots in sort of a linear fashion. You can see that the data doesn't go down to a 90 percent without co-benefit but with co-benefits, which we would expect on a bituminous unit, you can reach 90 percent overall. Well, both halogenated and plain carbons were tested at Monroe, but not yours.

HEARING OFFICER TIPSORD: Mr. Harrington, and then -- Go ahead.

MR. HARRINGTON: What was the SCA at Monroe?

DR. STAUDT: I knew you were going to ask that. I have it here, later in my notes. I can get to that. Monroe -- But now that you raised -- Monroe SCA was 258 square feet of collection per million per -- rather thousand cubic feet per minute of gas. Now we're going to get into in concept of SCA since you've raised it.

MR. HARRINGTON: I figure we get the

data out so when we got to it, it would make some sense.

DR. STAUDT: Yeah, yeah. But if you want me to go into my thoughts on SCA, we can do it now or later.

HEARING OFFICER TIPSORD: Let's wait until later. Mr. Forcade, did you have a follow-up on all this?

MR. FORCADE: Not until we get some data.

HEARING OFFICER TIPSORD: Okay. In that case, I think we're done with question 25 and 26 perhaps. Let's take a brief break. We've been at it about for about an hour and 45 minutes. 10 minutes, please.

(A 10-minute break was taken.)

HEARING OFFICER TIPSORD: I would anticipate we'll go an hour and-a-half and so we will take another break about five o'clock just so you can all plan your breaks. And I believe we were on Ameren's question -- Was 26 answered? We're on Ameren's question 27.

DR. STAUDT: Okay. 27, "At pages 127 and 128 of the technical support document, it

states, "The Allen plant is a low-sulfur coal application and Lausche Plant has a higher sulfur coal (although not as high a sulfur level as in most bituminous coals fired in Illinois). As shown, 90 percent removal is approached at injection rates of 7 pounds per million ACF. There is currently no test data on units with sulfur levels as high as those in Illinois coals." How do these results support a requirement of over 90 percent removal from facilities firing high sulfur Illinois coal using halogenated sorbent injection?" And the four small Meredosia have significantly higher sulfur level than what has been tested elsewhere. Therefore, these units are likely to present some difficulty with respect to control mercury through sorbent injection or achieving -- achieving 90 percent or the output based standard through sorbent injection, particularly at the rates -- or particularly at the emission levels in Illinois rule.

Hutsonville currently had a lower sulfur level than the Meredosia units but a little higher than where sorbent has been tested.

It's my understanding that Hutsonville plans to burn PRB once they've burned off their high sulfur coal industry. If this understanding of Hutsonville is correct, they should be able to comply with the rule. If this understanding is incorrect, then Hutsonville will continue to burn some high sulfur of coal and may also fall into the category bituminous units with high sulfur.

The other bituminous units are either scrubbed and will have a high co-benefit removal or they have coal sulfur levels in the range of what has been tested elsewhere.

HEARING OFFICER TIPSORD: Coal sulfur level?

DR. STAUDT: Coal sulfur level, yes.

HEARING OFFICER TIPSORD: Follow-up? Question 28.

DR. STAUDT: 28, "TOXECON. At page 129 of the technical support document, it states "Except on western coals downstream of a Spray Dryer Absorber, PAC, which is powder activated carbon, (untreated or halogenated) in TOXECON arrangements or fabric filter arrangements is generally acceptable to be capable of over 90

percent removal because the sorbent is in very intimate contact with the gas stream as it passes through the filter cake of the fabric filter." What is the basis for this statement?" As we spoke about a fabric filter before, and just to give you information, I don't know if TOXECON is shown -- if you go back to Figure -- Figure 8.7 in this --

HEARING OFFICER TIPSORD: Exhibit --

DR. STAUDT: -- Exhibit 52. And what TOXECON is, you have an existing electrostatic precipitator and you install a fabric filter downstream and between the electrostatic precipitator and the fabric filter, you inject sorbent and the sorbent, you know, removes the -- removes the mercury and it's collected on the bag.

In a fabric filter the gas passes through a filter that sorbent has built up on. This gives the gas very good contact with the sorbent for good mercury caption -- capture rather. This has been supported by several full scale and pilot scale tests. In fact, there have been no tests that I am aware where over 90

percent removal is not shown to be achievable. Even Southern Company has reported that 90 percent is achievable in a TOXECON arrangement with a properly designed baghouse, quote from the paper the co-authors is shown Table 8.2 which is a couple pages later. You can look at -- it's on the second to last page of Exhibit 52. And this shows the -- this is out of the TSD. You know, they said TOXECON units designed at lower air-to-cloth ratio than --

MR. HARRINGTON: What page are you referring to?

DR. STAUDT: This is the second to last page of Exhibit 52.

MR. KIM: It's also Table 8.2 of the TSD.

DR. STAUDT: Yes. It shows the data from -- taken at gas and for stimulated removal simulated -- simulated air-to-cloth ratio of 6.0 and air-to-cloth ratio is essentially how much fabric -- there's a ratio of how much air you are allowed to pass through how much fabric. So a low air-to-cloth ratio means that you have more fabric -- more fabric filters. You can imagine

-- Fabric filters, they're also called baghouses because they have like these long fabric bags, and they hang hundreds of thousands of them and they take the -- the air-to-cloth ratio is how many cubic feet -- a ratio of how many cubic feet of air pass through how many square feet of fabric in a certain amount of time. And the air-to-cloth ratio of six is what they've established as being the proper air-to-cloth ratio for a TOXECON system.

But you can see the quote there from Southern Company who has tested TOXECON on their Gaston Station, that it is capable of 90 percent mercury removal for the TOXECON baghouse is recommended that the maximum designed gross air-to-cloth ratio be 6.0 feet per minute.

HEARING OFFICER TIPSORD: And for the court reporter, TOXECON is T-O-X-E-C-O-N. Mr. Harrington?

MR. HARRINGTON: Would the -- Table 8.2 is referring to the Gaston study, the Southern Company; is that correct?

DR. STAUDT: Yes, that's from the Gaston study.

MR. HARRINGTON: And their baghouse was originally designed at 8 to 1 ratio, is it not?

DR. STAUDT: Their baghouse -- Yes, that's correct. It was designed -- It was never designed to be a TOXECON unit.

MR. HARRINGTON: And they did not achieve 90 percent operating at 8 to 1, did they?

DR. STAUDT: No, that's why -- that's why for TOXECON systems you design at 8.0. See, at Gaston Station they had an existing installation where years ago they installed a fabric filter downstream of their Hot-Side ESP. This is because to get better particular removal, and that fabric filter was designed from the start just to catch the small amount of particles, small amount of particle matter that escapes the Hot-Side ESP. It was never designed to catch more than that.

When they ran a test program there for TOXECON, because it was a convenient location, you already had the fabric filter, as I'm sure we're going to talk. Fabric filter installations are expensive. They take time to put into place.

So it was convenient for the Department of Energy to test this concept at the Gaston Station because they had this arrangement already there.

MR. HARRINGTON: And did they run an experiment of some kind to see whether it would work at 6 to 1?

DR. STAUDT: That's correct, yes.

MR. HARRINGTON: And how long was that experiment?

DR. STAUDT: That was a short-term test. It may have been a few days.

MR. HARRINGTON: A few days. Is there any unit that's been running the TOXECON system at 6 to 1 ratio for any period of time?

DR. STAUDT: Well, since we don't have -- No, because we haven't had the mercury rules to put these systems in place, nobody would put the TOXECON in place.

MR. HARRINGTON: Isn't it true that the system has been installed at Presque Isle?

DR. STAUDT: A system has been installed at Presque Isle, that's correct.

MR. HARRINGTON: What happened to that system?

DR. STAUDT: The system is -- today is up and running is my understanding.

MR. HARRINGTON: What happened when they started it up?

DR. STAUDT: They ran for several weeks, did some parametric testing. And after a period of time a fire was found in the baghouse and that has been attributed to inadequate evacuation of the fabric filter and improper operation of the hopper heaters. Carbon will not burn -- will not burn at the gas conditions that exist in a fabric filter. It won't ignite at about 300 degrees. It simply won't. We have to do -- The only way it will ignite is you need to heat it up. The -- At Presque Isle, like many plants, they have hopper heaters installed. And what they're designed to do is to prevent condensation from building up inside -- inside the hoppers. If you don't evacuate the hoppers, basically the solid that gets collected, if you don't evacuate it and if it builds up and the hopper heaters aren't properly set, well, low and behold they heat up -- it heats up to a temperature that's too high.

My understanding at the conference call last week with the project manager for that program, and from what they told me, it is up and running now as far as We Energy is concerned, who owns the plant. They see it as an operational issue. They've learned a lesson.

MR. HARRINGTON: But essentially the baghouse burned in significant part, didn't it?

DR. STAUDT: Excuse me?

MR. HARRINGTON: A significant number of bags burned?

DR. STAUDT: That is correct.

MR. HARRINGTON: And so you don't have data from that system at this point in time?

DR. STAUDT: Yes, we do. The parametric test data has been released.

MR. HARRINGTON: Under normal operating conditions?

DR. STAUDT: Under normal operating conditions, yes.

MR. HARRINGTON: What have they established?

DR. STAUDT: They can get over 90 percent -- 90 percent removal at about 2 pound

per million ACF, and that was using untreated carbon. They probably would get better performance -- a lower treatment rate with halogenated carbon.

MR. HARRINGTON: How long did they operate it?

DR. STAUDT: It was a period of several weeks.

MR. KIM: For the record I think we should have Presque Isle spelled for the court reporter.

DR. STAUDT: P-R-E-S-C-Q-U-E then I-S-L-E.

HEARING OFFICER TIPSORD: Ms. Bugel, did you have a question. No? Okay. I'm seeing things. Mr. Bonebrake?

MR. BONEBRAKE: Mr. Staudt, you mentioned that fabric filters are expensive. How extensive typically are fabric filters?

DR. STAUDT: They vary in cost based upon -- but you might see them in the range, you know, $40 a kilowatt to -- to a lot higher numbers, but certainly much more expensive than a sorbent injection system.

MR. BONEBRAKE: And what drives that cost range?

DR. STAUDT: The costs are determined by essentially the volume of gas being -- that's being -- being captured. The cost would also be driven by factors in terms of the -- you know, where it's located. There may be site specific things about duct work and what have you but there are a number of factors, but the biggest ones that determine the fabric filter unit cost are air-to-cloth ratio and the volume of gas it's creating and sometimes the level of the amount of particulate that's being driven.

MR. BONEBRAKE: So if you -- considering a unit that was planning to install a fabric filter for TOXECON purposes for mercury reduction in the manner that you have discussed, what would be your expected fabric filter cost?

DR. STAUDT: Are you referring just to the fabric filter or the entire total installed --

MR. BONEBRAKE: Right now I'm just talking about the fabric filter portion of the TOXECON arrangement.

DR. STAUDT: It might be in the range of about $30 a kilowatt or so.

MR. BONEBRAKE: And that's below the $40 kilowatt number that --

DR. STAUDT: Well, I guess, you know, I gave you a number basically somewhere in the range of, you know, these -- I can't give -- there isn't an exact number. You're asking me off the top of my head because there are a lot of variables that might determine what that cost might be.

MR. BONEBRAKE: What does -- what does $30 per KW translate into for a 300 megawatt facility?

DR. STAUDT: I think it would be about nine million dollars.

MR. BONEBRAKE: So are you saying, Mr. Staudt, that a 300 megawatt facility in Illinois could install a baghouse for approximately nine million dollars?

DR. STAUDT: No, I didn't say that. Because you asked me just the fabric filter itself. There are other costs involved too, and that would be the duct work and ID fan and things

like that.

MR. BONEBRAKE: Okay. What would be the additional costs above and beyond the nine million for the entire baghouse?

DR. STAUDT: That will vary. That will vary based upon the specific site. Very -- You know, Presque Isle was an expensive application because there was long series of duct work and they had three very small -- three small boilers that they had a complex duct work just to get them -- the duct work connected together and, in fact, it's shown --

HEARING OFFICER TIPSORD: You're fading away from the microphone.

DR. STAUDT: In Exhibit 52, I think it's the fourth page on Exhibit 52, it's Figure 8.12. It says configuration of the TOXECON system at the Presque Isle plant in Marquette, Michigan. What you can see is they -- normally you would want to have the fabric filter located right next to the duct work and near the stack. Apparently there wasn't the room there. They had to locate it at another location so there was long duct work -- long set of duct work and there

was -- and that in this situation three boilers, so a lot of dampers and other controls that had to be added. So this would be pretty -- this I would say is probably a very costly approach. You know, this is towards the high end of the complexity but there might be others that could approach it. But in most cases I would expect -- in many cases there might be -- might be less complex than this, but it's going to be determined at each individual location.

MR. BONEBRAKE: Is there a rule of thumb from your perspective, Mr. Staudt, on how much the total baghouse would cost as compared to the nine million dollar figure for the fabric filter that we were talking about earlier?

DR. STAUDT: You know, there is not an easy rule of thumb because you have to look at every application specifically.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Perhaps for the Board and the record it would be useful you can describe the components of the baghouse installation so we get a better picture of what

we're talking about for the Board. I have an understanding but it's a layman understanding. Rather than me asking many questions, maybe you could explain everything that goes into it.

DR. STAUDT: Okay.

MR. HARRINGTON: If that's appropriate.

DR. STAUDT: The fabric filter itself, it's a large box. Imagine a large box on the top. There's a plenum which is basically a steel sheet with holes in it, all right. Above the plenum is the clean side. Below the plenum is the dirty side. What happens through these holes you drop baskets, long baskets and around those baskets you have filter bags and these are maybe 20 feet long or so. Think about a sock about that much -- about 6 inches in diameter that's say 20 feet long. And they're -- depending upon the size of the baghouse, there may be 100s, maybe, you know, a thousand bags or more. There are large big boxes. The gas flows up through, you know, through these -- through these series of socks basically, excuse me, filter bags, passes from the dirty side through the clean side

and the particles stay -- the solid particles stay on the outside of the bag.

Periodically, depending upon the type of baghouse, some are called reverse -- reverse gas baghouses, some are called pulse jet baghouses, but there's a cleaning -- cleaning action where periodically they, you know, this big baghouse with this plenum, they're actually different compartments. They shut the compartment pulse -- either send a pulse of air backwards through the bags or they actually blow gas backwards through the bags. That takes the dirty particles. They drop down into what are called hoppers below, basically a big bin at the bottom of the baghouse. Then, you know, over time, you know, what you do is as that stuff collects in the bottom in the hopper, you -- actually there's typically a -- the rotary valve or air lock or something like that that continue -- that takes this material and goes -- takes the solid down to material handling system like a conveyer or something like that and then it gets carried away.

As you can imagine, putting gas

through this filter bag, there's a pressure drop and depending upon how extensive duct work is, there may be additional pressure drop from that. And so usually when you get -- put in a fabric filter, you put in a booster fan as well to overcome this additional pressure drop. So the main components are this big device called the fabric filter. There is, you know, the filters inside. There's duct work. There's a fan and it's, you know, it draws power, and we're going to have questions about the power it draws and, you know, and that's -- those are the key components, and there's the duct work to get to and from the boiler.

And if you're -- if you're doing what they're doing at Presque Isle, they're trying to connect three different boilers together. You got a lot of dampers too. So, you know, you got these big -- think of them as a valve for a big duct, you know, something that opens and shuts, a big duct, so there's a lot of equipment involved.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Maybe just to

complete the picture, for example, at Presque Isle, what would be the approximate dimensions of this baghouse?

DR. STAUDT: Oh, off the top of my head I don't know.

MR. HARRINGTON: Are we talking 20 feet by 20 feet or hundreds of feet?

DR. STAUDT: It's probably bigger than that. I mean, I haven't been to the Presque Isle plant so I don't know exactly what it would be. It's probably maybe on the order of 40 feet by 40 feet, but I'm -- I don't know exactly off the top of my head.

MR. HARRINGTON: When you speak of the ducts, what would be the size of the duct work typically at a power plant?

DR. STAUDT: Oh, the ducts can be maybe, you know, 10 feet by 20 feet, 10 feet by 30 feet, things like that. So it's fairly large pieces of duct work, yeah. That's the cross section.

MR. HARRINGTON: And the fans will have to move the air from the original exit point of the plant through the baghouse -- through the

baghouse back to the stack and up the stack; right?

DR. STAUDT: That's correct.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: The Presque Isle power plant, is its capacity around 270 megawatts?

DR. STAUDT: Yeah. We have three -- three units, each one 90 megawatts, yeah.

MR. BONEBRAKE: And was the cost of the TOXECON system at that plant about $126 per kilowatt?

DR. STAUDT: Somewhere in the range of that. It's 120 I've heard, yeah.

MR. BONEBRAKE: And did you calculate the cost of TOXECON system at one of the Waukegan units, Mr. Staudt?

DR. STAUDT: Waukegan and Will County, yes.

MR. BONEBRAKE: Are those cost calculations reflected in Table 8.9 of the TSD?

DR. STAUDT: Yes, they are.

MR. BONEBRAKE: I believe page 163 of the TSD?

DR. STAUDT: Yes.

MR. BONEBRAKE: What was your total cost calculation for the TOXECON system on -- at the Waukegan unit for which you indicated a TOXECON system would be required assuming that it is your indication from this table?

DR. STAUDT: Well, I used $60 a kilowatt, so I'll look at what --

HEARING OFFICER TIPSORD: Excuse me. What plan are we looking at again?

DR. STAUDT: At Waukegan it was almost 20 million dollars.

MR. BONEBRAKE: And was that Waukegan Unit No. 7?

DR. STAUDT: I believe so, yes.

MR. BONEBRAKE: And does that particular unit have a Hot-Side ESP?

DR. STAUDT: That is correct. That's my understanding.

MR. BONEBRAKE: And did you determine then that the TOXECON system at that particular unit would be required to comply with the proposed Illinois rule?

DR. STAUDT: It was my -- when I

estimated the cost, it was my opinion that that was the technology that could achieve 90 percent removal and comply with the Illinois rule. That's not to say that the plant may choose another technology.

MR. BONEBRAKE: The -- You mentioned a $60 per KW figure?

DR. STAUDT: That's correct.

MR. BONEBRAKE: Can you describe for us how you arrived at that number?

DR. STAUDT: That's fairly consistent with what -- in the same range as what EPA and what I've seen from EPRI in the past, but 120 is high and that's not to say that these units might not have costs that are higher than what I've shown here.

MR. BONEBRAKE: The -- the number you've reflected for that Waukegan unit is 19,680,000, is that correct, for the TOXECON system?

DR. STAUDT: That's correct.

MR. BONEBRAKE: Does that include the capital cost and all installation cost for both the --

DR. STAUDT: That's intended to be all inconclusive.

MR. BONEBRAKE: All inconclusive. And in terms of the equipment and installation activity that are included in that figure, can you describe all of that for us, please?

DR. STAUDT: I did not do a detailed engineering analysis of the site. What is typically done on these kind of cost estimates is you use representative numbers. It's a dollar per kilowatt. And I did not breakdown how much of that was steel versus labor versus other -- other materials.

MR. BONEBRAKE: Does the cost number that you have there reflect then the installation of a baghouse?

DR. STAUDT: It reflects the -- all capital costs -- all of the -- all capital costs associated with installing fabric filter, duct work and the -- and the sorbent injection system, but recognizing that I did not have the opportunity to include any -- do a detailed site specific analysis. So there is a possibility that that could be -- that if some were to

actually install a TOXECON system at that unit, it might be -- the cost might be significantly different.

MR. BONEBRAKE: I assume you haven't seen any cost proposal with respect to installation of such a system at that particular unit?

DR. STAUDT: No, I have not.

MR. BONEBRAKE: You are -- is it also your opinion, and I'm looking a little bit lower down on Table 8.9, still on page 163, with respect to the Will County site where you identified TOXECON?

DR. STAUDT: That's correct.

MR. BONEBRAKE: With respect to the Will County site, is it also your opinion that TOXECON would be required for that Will County unit to comply with the proposed Illinois rule mercury reduction requirements?

DR. STAUDT: Well, again, the approach that the rule did not specify an emission -- a technology for emission reduction requirement, it's my opinion that this is a technology that -- that will enable the plant to achieve, comply

with the emission reduction requirement, but the plant may choose another course. They may find a better way to do it.

MR. BONEBRAKE: Well, is it your view that installation and operation of ACI alone, that is, without a -- also the installation of a baghouse, would permit the Will County unit to achieve the reduction requirements specified by the proposed Illinois rule?

DR. STAUDT: If the sorbent injection is done with -- in a TOXECON arrangement, I believe it would enable the plant to meet the emission reduction requirements. Without a TOXECON arrangement, I am less certain. I haven't seen data that indicates that sorbent injection alone upstream of a Hot-Side ESP will get those kind of removal rates.

MR. BONEBRAKE: And your cost calculation for the TOXECON system, it -- Actually let me identify this unit. Which Will County unit is it that you've identified as a TOXECON unit?

DR. STAUDT: That -- I believe it's Will County 3.

MR. BONEBRAKE: And your projected cost for a TOXECON system at that unit is 17,940,000; is that right?

DR. STAUDT: Well, this is --- this is basically a ballpark cost. This is -- it's just used as an example cost. In terms of estimating, that's how -- I used $60 a kilowatt. As I said, actual cost, if that's the way the company pursues it, it maybe be higher, may be lower.

MR. BONEBRAKE: Did you use the same methodology that you described for us with respect to the Waukegan unit for the Will County unit to derive the cost number?

DR. STAUDT: That's correct.

HEARING OFFICER TIPSORD: Ready to go on to question 29? Mr. Harrington?

MR. KIM: Can I ask one follow-up question of Mr. Nelson before we go on?

HEARING OFFICER TIPSORD: Sure.

MR. KIM: I haven't asked before this, but he may not be able to answer. Concerning the two TOXECON estimates that Dr. Staudt was describing, would your understanding of those -- of those facilities in that application yield the

same type of cost figures, or would it be any different than Dr. Staudt's?

MR. NELSON: He provided all the information that I'm aware of as well, so it's reasonable.

MR. KIM: Okay.

MR. NELSON: But again, there may be Hot-Side sorbents that will work cheaper than that but that remains to be seen.

MR. KIM: Thank you.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: We may pick this up again, but with respect to the TOXECON cost estimates at Presque Isle, do you have any reason to believe that any installation that might be required on Illinois facilities wouldn't be in the same range as the Presque Isle cost?

DR. STAUDT: I have no reason to believe that they'd be higher than that. My expectation is that that is a fairly complex application so that's probably towards the high end, and in some cases they may approach that, but I haven't look -- I haven't made detailed --

a detailed estimate of what it would be.

MR. HARRINGTON: Have you been keeping track of costs, steel, fans, baghouses over the last year or so?

DR. STAUDT: I don't -- I don't have -- I don't maintain a database myself, but I'm generally aware that costs have, you know, some costs have been going up.

MR. HARRINGTON: Do you have any idea by how much?

DR. STAUDT: Not -- No, I don't.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: A follow-up clarifying question, Mr. Staudt. The $60 per KW number that we've been talking about, that doesn't include any unit specific upgrade requirements such as an upgrade in fans that might be required with the installation of the TOXECON system; is that correct?

DR. STAUDT: No, that's not correct.

MR. BONEBRAKE: Okay. Can you describe for me what was inaccurate in the

statement I just made?

DR. STAUDT: Could you repeat the question, please?

(The Reporter read from the record as follows: A follow-up clarifying question, Mr. Staudt. The $60 per KW number that we've been talking about, that doesn't include any unit specific upgrade requirements such as an upgrade in fans that might be required with the installation of the TOXECON system; is that correct?)

DR. STAUDT: Yeah, that's incorrect. That would be an incorrect statement. In my -- The $60 per kilowatt number is intended to be an all inclusive number, but bearing in mind, this is a very rough estimate, not intended to be a detailed engineering study. This is -- this is basically using, you know, the type of -- the type of very first order approximate cost estimate of the nature that perhaps somebody like EPA use -- the USEPA might use in terms of establishing a rule. I did not do a detailed engineering evaluation so I don't have line item

cost for what makes up that $60 kilowatt number. I hope that clears the air on what it does and what it doesn't.

MR. BONEBRAKE: I think so, but let ask a follow-up. I assume, therefore, that it would not surprise you if they -- if a cost calculation generated from a detailed engineering study of a TOXECON system would result in a cost estimate considerably higher than the numbers in your chart?

DR. STAUDT: It would not surprise me if the cost were -- were considerably higher, but one of the things I thought about is if -- even if you doubled the estimates that -- doubled it from 60 to $120 a kilowatt, if you take that cost -- if -- took each one of them from, say, roughly 20 million to 40 million for a total impacted cost for the rule of about 40 million, an additional 40 million dollars on an annualized basis using about 15 percent, that's about a six million dollar annualized cost impact to the rule across the state. So that's about -- so if you look at the total cost of the rule that I've estimated cost over CAMR of being somewhere in

the range of 30 to 40 million dollars, well, now, you know, it changes by perhaps 20 percent even if the cost of those units are much greater.

HEARING OFFICER TIPSORD: Mr. Bonebrake, are you --

MR. BONEBRAKE: I was just going to say the calculations you just referred is predicated upon all the units in the state meeting only the technology that you've identified in Table 8.9; is that correct?

DR. STAUDT: Well, the calculation I've -- was based -- That's not correct. It's based upon those two units. The other -- Those two -- I'm assuming that those two units might use TOXECON and only -- I'm only looking at those two units. They may not -- the owner of those units, Midwest Generation, may choose to not use TOXECON because perhaps Sorbent Technologies may have a better sorbent to help them or some of these other units may choose something other than sorbent injection, but this is -- this estimate is based upon an assumption about what people might use to comply with the rule.

MR. NELSON: If I may, another less

expensive technology than TOXECON is simply to change your duct work so you convert your Hot-Side into a Cold-Side. We've done work with Hot-Sides. Duke has a lot of these. They're small units. And that is really the alternative that they were looking at. The way the typical gas train works is the gas comes out about 700 degrees, then you -- if you have a Hot-Side ESP, it operates at 600, 700 degrees, then it goes through an air pre-heater that drops it to 300, then you go to a Cold-Side ESP if it's on a Cold-Side. But what Duke was considering in the alternative though with North Carolina rule is --

HEARING OFFICER TIPSORD: You're dropping off.

MR. NELSON: Taking those Hot-Sides and simply reconfiguring the duct work so that you go through your air pre-heater first and then you go through -- your Hot-Side becomes a Cold-Side then and then you can do your typical Cold-Side injection. And that's a lot less expensive than building a fabric filter, but on the other hand, you don't get the benefit of the fabric filter. Then you still have your existing

electrostatic precipitator. So it's not just either or. There's multiple technologies and alternatives that are out there, and you have engineering companies come in and figure out what the alternatives are and the cost and you can make a decision based on that.

HEARING OFFICER TIPSORD: Mr. Ayres?

MR. AYRES: This is for Dr. Staudt.

HEARING OFFICER TIPSORD: Give -- Again, they're very directional. You have to speak right into it.

MR. AYRES: I think this is the appropriate time to ask it. Dr. Staudt, is your experience that once a regulation is adopted, that the actual cost of compliance are typically less than or estimated prior to the time the regulation was adopted?

DR. STAUDT: Well, yeah. Generally what happens is once the regulation is adopted, people -- people become conscientious about installing technology and doing it, you know, complying with the rule in the lowest cost approach that's possible. I don't pretend to be able to say that this -- what I've come up with

is necessarily the lowest cost approach. The companies in this room have some smart engineers. I know a number of them. And I'm sure they're clever enough to find some pretty good ways to deal with this rule should it pass.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: Mr. Nelson, you're not an engineer; is that correct?

MR. NELSON: Yes, I'm an engineer.

MR. BONEBRAKE: What are all the engineering factors that must be considered in determining the feasibility of converting Hot-Side to Cold-Side with respect to an ESP?

MR. NELSON: It's going to be a very site specific calculation because you would be constructing different duct work. The plant would obviously be down for a period. You could pre-build some of it, but it would it be down for, you know, while you were making the connections. The risk there is you want to make sure that the existing ESP works as a Cold-Side. What happened there were some questions on SCA. SCA is specific collection area is calculated

based upon the actual cubic feet of gas, and at the 700 temperature or 600 temperature the gas molecules are 50 percent further apart --

HEARING OFFICER TIPSORD: We're losing you.

MR. NELSON: -- so in converting it to a Cold-Side, your SCA goes up by 50 percent which generally makes -- improves the collection. But it's going to depend on the age of ESP, for example. It's going to depend on the geometry of the arrangement, and it's going to be a very site specific calculation.

MR. BONEBRAKE: And I assume you've not done those kinds of calculations or analyses with respect to either of the two Midwest Generation Hot-Side units?

MR. NELSON: No. Of course not.

HEARING OFFICER TIPSORD: Ready to move on? Question No. 29.

DR. STAUDT: Number 29, "Has any pilot test been done employing the halogenated activated carbon injection prior to a baghouse called the TOXECON arrangement on western coals that consistently achieve over 90 percent

removal?" Well, I think the word consistently is in there and -- but I'll give you my answer.

The pilot test is a full scale test on western coal, and fabric filter and halogenated sorbent have shown over 90 percent removal consistently every test. So we have pretty strong reason to believe that on almost any situation, that I can imagine, you would get over 90 percent removal with the carbon on a fabric filter.

According to the data released by ADA Environmental Solutions and WE Energys, the testing at Presque Isle, which is a TOXECON arrangement with Powder River Basin coal shows 90 percent removal at 2 pound per million ACF using untreated carbon. Halogenated carbon would provide even better performance.

HEARING OFFICER TIPSORD: Question No. 30. Dr. Staudt, on some of these -- like you've already answered -- but if you think you've already answered, please don't hesitate to let us know.

DR. STAUDT: Okay. 30, "Based upon the statements in the report, are you stating

that 90 percent removal would not be achievable downstream of a Spray Dryer Absorber?" No. It would be achievable using halogenated carbon. It would be also achievable with untreated carbon on a unit with western coal where some halogens were added to the fuel or flue gas. However, it would not be achievable with untreated carbon on western coal without the additives.

HEARING OFFICER TIPSORD: Question 31.

DR. STAUDT: Okay. 31, "At page 129, you reference the southern company Gaston Station. Was not that facility burning bituminous coal?" Yes, Gaston was burning bituminous coal which is actually more difficult than western coal.

HEARING OFFICER TIPSORD: Question 32.

DR. STAUDT: "Is not the Presque Isle facility a federally funded test program to determine the effectiveness of the TOXECON system?" Yes, it is 50 percent federally funded and is a test to the TOXECON system. I am not sure of the specific project objectives that are -- that might be stated in the project. I think someone would have to go to DOE's documents to

find that.

HEARING OFFICER TIPSORD: 33.

DR. STAUDT: "Why is the government funding this test if the technology and its performance are already demonstrated?" That's a better question for the Department of Energy to answer. The Presque Isle project was committed to a few years ago before much of the halogenated sorbent test result and information was available. Am I speaking loudly enough?

HEARING OFFICER TIPSORD: Yes. But slower, please.

DR. STAUDT: I'll start again. The Presque Isle project was committed to a few years ago before much of the halogenated sorbent test results and information was available. In the meantime, Sorbent Technology has come a long way so it'd be fair to DOE, it was a good idea at the time because we didn't know then what we know now that there are options other than TOXECON for western coal.

Moreover, it's worth noting that the Presque Isle plant is the big beneficiary of this program because they got a costly environmental

retrofit at half price. This retrofit probably would have been necessary at some point due to the plants Hot-Side ESPs and now the long-term viability of the Presque Isle plant is much better thanks to this program regardless of whether they choose to inject carbon in the future for mercury control.

HEARING OFFICER TIPSORD: Question 34. I believe you've answered that one about the fire in the baghouse?

DR. STAUDT: Yes.

HEARING OFFICER TIPSORD: Question 35.

DR. STAUDT: 35, I think we went through that that's --

HEARING OFFICER TIPSORD: Right. 36.

DR. STAUDT: I think we -- I think we went through this in detail.

HEARING OFFICER TIPSORD: 37. And obviously, Mr. Harrington, if you think we haven't sufficiently, then --

DR. STAUDT: Yeah. I think we talked about 37 as well.

HEARING OFFICER TIPSORD: 37.

DR. STAUDT: Aside from 37, I think

I've already done it.

HEARING OFFICER TIPSORD: Okay. 38.

DR. STAUDT: "Aside from Presque Isle -- aside from Presque Isle, which is not presently operating, that's a question, is there any other TOXECON array, halogenated activated carbon injection prior to a baghouse, in operation on which reliable data can be obtained whether on western low sulfur coals or bituminous coals?" And the -- 38; right?

HEARING OFFICER TIPSORD: Yes.

DR. STAUDT: Make sure I don't -- It's my understanding that the TOXECON system is back in operation, and that was based upon a phone call with the project manager last week. As noted earlier, there are numerous tests. There's the gas-to-field test to the TOXECON system and that was -- that lasted for many months, and several tests on other plants with fabric filters that have shown that TOXECON will provide over 90 percent removal on the type of boiler that you've described in the question. And there are, as I mentioned, there's been a lot of data on fabric filters.

HEARING OFFICER TIPSORD: Ms. Bassi has a follow-up.

MS. BASSI: We're on number 38; is that correct?

DR. STAUDT: That's correct.

MS. BASSI: Quite the follow-up, isn't it? Okay. I believe you said Gaston was a bituminous site. Were there some low sulfur sites as well?

DR. STAUDT: Low -- Well, actually bituminous is harder than a low sulfur site, but there were some low sulfur sites. They weren't TOXECON. They were fabric filters which are essentially from the perspective of controlling mercury. The whole purpose of a TOXECON is to put a fabric filter there because you get much better contact. There's been tests at Holcomb. There's being pilot testing at the Pleasant Prairie Station, which is -- is a PRB plant, and Stanton, which in the case of Stanton, it's a lignite coal.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Perhaps I misread it.

The facilities you just named, were those TOXECON systems for baghouses?

DR. STAUDT: Well, no. They -- Well, Gaston definitely was. The others -- the others were fabric filters, existing fabric.

MR. HARRINGTON: With any kind of injection of halogenated activated carbon?

DR. STAUDT: Yes, I believe so.

MR. NELSON: Again, just to clarify, there have been tests -- Stanton has two boilers. Stanton 1 and Stanton 10. Stanton 10 has fabric filter, and there were halogenated sorbents tested in that. Stanton 1, which I described earlier, has a Cold-Side ESP, and halogenated sorbents were tested there. But there are two different boilers at Stanton.

MR. HARRINGTON: Is that Stanton done through a dry scrubber prior to the baghouse?

MR. NELSON: Yes. It's a spray dry fabric filter, correct.

HEARING OFFICER TIPSORD: Anything further? 39.

DR. STAUDT: 39, "With respect to design issues and with reference to the Gaston

Station facility, did not these tests demonstrate the importance of understanding the total particulate load to the baghouse an appropriate design?" Yes. That's why they established a guideline for air-to-cloth ratio 6.0 or less, and that was basically a conclusion of the study.

Baghouses are very well understood technology. They've been around for decades. The air pollution control industry has lots and lots of experience building baghouses. The fabric filter at Gaston was installed -- I think we talked about, was installed several years ago never with the intention of just capturing the small amount of particle matter that escapes the Hot-Side ESP, never with the intention of having -- adding additional material. So had -- had they started out with the intention of installing a TOXECON system, they would have done some things differently. They would have made it a bigger baghouse with a lower air-to-cloth ratio.

HEARING OFFICER TIPSORD: Question 40. Sorry. Mr. Harrington?

MR. HARRINGTON: There are multiple sources of particulate that might be for a

baghouse on an electrical generating unit, are there not?

DR. STAUDT: Multiple sources of particulate?

MR. HARRINGTON: Well, start with the particulate that may come off the system originally?

DR. STAUDT: That's correct.

MR. HARRINGTON: Which may pass through the existing ESP and that particulate has certainly -- usually has certain characteristics which are taken --

HEARING OFFICER TIPSORD: You need to speak up or speak closer to the mike.

MR. HARRINGTON: The particulate which passes through the ESP and might be captured in the baghouse, whether it's there for that purpose or not, has certain physical characteristics that need to be taken into account or design, do they not?

DR. STAUDT: That's correct.

MR. HARRINGTON: If you're going to then add the halogenated activated carbon or point activated carbon, that also has certain

characteristics that need to be taken into account in design?

DR. STAUDT: Well, that's correct, yes.

MR. HARRINGTON: And if you're going to add a spray dryer in there, there's additional particulate that the baghouse has to deal with and that needs to be taken into account, doesn't it?

DR. STAUDT: That's correct. And air pollution control companies know how to do this.

MR. HARRINGTON: I'm not arguing if they do.

DR. STAUDT: Yeah.

MR. HARRINGTON: They -- And they take into account the veracity of the bag among other things?

DR. STAUDT: That's correct.

MR. HARRINGTON: And estimating how often the cleaning cycle must occur?

DR. STAUDT: That's correct.

MR. HARRINGTON: In handling the particulate?

DR. STAUDT: That's correct.

MR. HARRINGTON: Also, in fan size and fan design?

DR. STAUDT: All of these things are correct.

MR. HARRINGTON: So if someone concluded that a baghouse was necessary to -- a TOXECON system is necessary, they also in designing that have to take into account all these other factors which may be site specific; is that correct?

DR. STAUDT: Yes.

MR. HARRINGTON: So even though baghouses are well understood in numerous applications, probably more outside the power industry, it is still going to require an engineering effort to get both the proper design of the baghouse as well as all the systems to get the air there and back to the stack?

DR. STAUDT: Well, that's correct.

MR. HARRINGTON: Do your cost estimates take all that into account?

DR. STAUDT: Yes. My cost estimates, you know, we're going to get back to -- we keep coming back to the same thing. My cost estimates

are not intended to be detailed. I don't -- I don't have estimates of the engineering man hours in there. The total cost might be higher. It might be lower. These are not intended to be detailed costs. And the air pollution control industry and these engineers at these power plants are smart guys. They know how to do this stuff, and they know how to do it right.

MR. HARRINGTON: That's why Presque Isle happened; right?

DR. STAUDT: Well, sometimes the operators make mistakes.

MR. HARRINGTON: But if -- This is a hypothetical. If a significant portion of EGUs in Illinois had to install a TOXECON system --

HEARING OFFICER TIPSORD: Mr. Harrington, we're losing you.

MR. HARRINGTON: If a significant number of the EGUs in Illinois had to install a TOXECON system, do you have an opinion as to the availability of the engineering talent to do the design on all these systems within the schedule established by the Illinois rule?

DR. STAUDT: Well, you say a

significant number?

MR. HARRINGTON: Yes.

DR. STAUDT: Well I -- Do you have --

MR. HARRINGTON: It's a hypothetical.

DR. STAUDT: Hypothetical, what's a significant number? I think two is a significant number and obviously I believe that's --

MR. HARRINGTON: Well, if I said half or 80 percent?

DR. STAUDT: Well, first of all, I think if you said 80 percent, or even -- I know one of the questions here we're going to get to is all of the units. That's a -- First of all, it's completely so remote that it's, you know, when I thought about -- when I read that question about what if all the units had to install mercury control -- install TOXECON systems, I was thinking, you know, it's like I'm more concerned about being hit by a giant astroid, I mean, you know, that's so remote. It's a ridiculous question.

But having said that, this is an industry that installed just in 2003 over 40,000 megawatts of SCR. At the same time it was

brought on line for that -- for coal about an equal number of gas-fired SCRs. And this is an industry that has been able to respond to these challenges. It's an industry with companies like GE, Siemens, Alstom, some of the biggest companies in the world. And if -- if all of a sudden there's a demand, there will be a supply.

MR. HARRINGTON: Nothing further.

HEARING OFFICER TIPSORD: Question 40.

DR. STAUDT: Section 8.4.5.4 of the technical support document states at pages 142 and 143 -- excuse me. "Section 8.4.5.4 of the technical support document at pages 142 and 143 makes reference to the build up -- excuse me -- of carbon on duct surfaces. Could not that build up interfere with the operation of the facility?"

Utility boilers already accumulate fly ash which includes carbon on internal duct surfaces and you can -- there normally is a lot more fly ash collecting on the duct surfaces than there is in -- then there would be -- ever would be activated carbon. So you go to, it's the second to last page of this Exhibit 52 --

HEARING OFFICER TIPSORD: Uh-huh.

DR. STAUDT: -- you look at Figure 8.16, that's estimated carbon content and fly ash for different coals and injection rates. What this shows is for different injection rates, and look -- the figure we're looking at typically for a Powder River Basin coal injection rate of about 3 pound per million ACF. And this data was actually taken from Sorbent Technologies -- this is from the EPA. Oh, that's right. This is from the EPA, USEPA report. Okay. But it shows, you know, basically a 3 pound per million ACF one and-a-half percent to the particulate loading in the duct work is going to be from activated carbon.

That means that 98.5 percent of the particles in there of the dust flying around in there is fly ash, so, yeah, there's a little bit going in there but there's a lot more other stuff flying around so it doesn't, you know, I don't see it making a difference.

HEARING OFFICER TIPSORD: Question 41.

DR. STAUDT: 41, Could not the build up of carbon also occur in the ESP?" Well, could the build up of carbon -- while it's collected in

the ash -- in the hopper, once it's collected, it goes down to the hoppers and then it's evacuated. And I'm not sure that's -- in a properly operated designed ESP, the carbon basically would be removed, but it's also -- but number 1, there's an awful lot of carbon, in most cases there's more carbon in the fly ash already because without the -- without the additional activated carbon that's injected because some portion of the coal -- some portion of the coal doesn't burn. We don't get -- we would like to have 100 percent perfect combustion of the coal but some portion of it doesn't and it's -- and it's not unusual to have a few percent of the fly ash be carbon. And sometimes, you know, I've seen, you know, 10, 20, even 30 percent of the fly ash is carbon. So more often than not there's more carbon in that fly ash before you even add the activated carbon.

HEARING OFFICER TIPSORD: Question 42.

MR. HARRINGTON: Could we read that last answer back?

(The Reporter read from the record as follows: 41, Could not the build up

of carbon also occur in the ESP?"
Well, could the build up of carbon --
while it's collected in the ash -- in
the hopper, once it's collected, it
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it's evacuated. And I'm not sure
that's -- in a properly operated
designed ESP, the carbon basically
would be removed, but it's also --
but number 1, there's an awful lot of
carbon, in most cases there's more
carbon in the fly ash already because
without the -- without the additional
activated carbon that's injected
because some portion of the coal --
some portion of the coal doesn't
burn. We don't get -- we would like
to have 100 percent perfect
combustion of the coal but some
portion of it doesn't and it's -- and
it's not unusual to have a few
percent of the fly ash be carbon.
And sometimes, you know, I've seen,
you know, 10, 20, even 30 percent of

the fly ash is carbon. So more often than not there's more carbon in that fly ash before you even add the activated carbon.)

HEARING OFFICER TIPSORD: Anything further? Question 42.

DR. STAUDT: The question 42, "With a build up of carbon in the ducts and the ESP, is there not an elevated risk of fire in the duct work or ESP?" No. Keep in mind that the coal doesn't burn completely. I think we discussed this. There's already carbon in there. There's no increased likelihood of fire over what you already -- of what already -- what you already have.

MR. NELSON: If I could elaborate on one thing. Activated carbon in the production of activated carbon, they start with coal. The first step is to carbonize it, which devolatilizes it, which makes it no longer explosive, whereas, coal dust, for example, there are concerns about that. It's not a concern of activated carbon because the volatiles are already gone. It will burn because it's carbon

if there's a flame and you get it burning, but it's much, much safer, for example, than you hear about coal explosions and things at the power plant. That's not an issue with activated carbon.

HEARING OFFICER TIPSORD: Question 43.

DR. STAUDT: "Did you prepare table 8.1 of the technical support document dealing with sorbent injection field demonstrations?" Yes. Is it correct that of the 41 studies listed here, only nine were on PRB coal -- "Is this correct of the 41 studies listed here, only nine were on PRB coal?" I counted 13 on PRB, and some show up in the table that subbituminous -- subbituminous -- PRB is a type of subbituminous coal and the subbituminous coal, things show -- the tests shown here is subbituminous and we're PRB coals. Also, there are about 10 on lignite which has many of the same issues regarding sorbent injection as PRB except lignite is actually slightly more difficult.

The purpose of this table was really to show how much testing there has been on such a wide variety of coals and boiler configurations.

This table shows a lot of activity and, frankly, it's only a part of the total activity associated with mercury control technology. It's all the work that's been going on with scrubbers and other things, so the industry has been pretty active.

44(a) -- or 44, "As to each of such demonstrations, state your knowledge at the time your testimony was prepared as to each of the following elements: A, Is the size of ESP and the length of time of the study; the maximum, minimum and mean removal rate achieved on each; the method used for measuring mercury in the emissions; the method used for measuring mercury in the coal charge to the furnaces; the length of each study; statistical method used to predict/analyze the data resulting from the study and predict future removal rates; whether the conditions upon which the study was run are comparable to those conditions that would be expected in a year-round operation under normal operating conditions; as to the Presque Isle study with a TOXECON system, please describe the current status of that study and whether there

have been any significant problems with the study."

Well, I think we can -- we've already talked about "H", okay. The size of the ESP and length of time of the study. Now a couple of things, first, I'm not sure if it makes sense to go through every one of these studies because I didn't use those studies. As I indicated earlier, most -- that table was not -- was put together to show the amount of activity but -- but I'll be happy to talk about the -- the -- the test, provide the data on the test that I used to form my opinions relative to Illinois coal.

MR. HARRINGTON: That would be appropriate.

DR. STAUDT: Okay. And -- Okay. Let's talk about -- First of all, you folks understand now what an ESP is, how it works? Okay. We got this -- There's SCA, size of ESP. ESPs are -- the size is represented in specific collection area.

HEARING OFFICER TIPSORD: Microphone.

DR. STAUDT: Sorry. The size is represented to the specific collection area. And

-- and I think that was discussed earlier by Sid by what that means. It's basically the -- how many square feet of collection surface are in the ESP relative to the amount of gas that was flowing through it. It's one of the many, many things that affect the performance of, you know, determine the performance of an ESP, but I think we've got more questions about SCA and I'll go into that later.

I'll give you the numbers: Meramec was a 30-day test. The Meramec, that's M-E-R-A-M-E-C, 30-day test, PRB fired, 140 megawatts and the SCA of the ESP is 320. St. Clair, that's DTE St. Clair, 30-day test, fires mostly PRB, about 85 percent is 160 megawatts with an SCA of ESP equal to 700. The Pleasant Prairie was actually a slipstream so the -- the measurements actually taken were prior to -- with halogenated sorbents were prior to -- to a -- there was tests. They were full scale tests done with untreated sorbents but the test with halogenated sorbents were slipstream. So Pleasant Prairie fires PRB of 600 megawatts.

MR. HARRINGTON: How were --

DR. STAUDT: The test results on Figure 8.10, those were slipstream tests that were shown.

HEARING OFFICER TIPSORD: He was asking I think about the rates.

MR. HARRINGTON: You said Pleasant Prairie, I missed how long the test was?

DR. STAUDT: That was a short -- that was a slipstream, so it probably went a few days. That was a short-term test.

HEARING OFFICER TIPSORD: Mr. Forcade?

MR. FORCADE: Was Pleasant Prairie a pilot scale or full scale?

DR. STAUDT: I mentioned it was a slipstream which would be a pilot scale. The test results -- there was a full scale test using untreated carbon, okay. There was a full scale test to Pleasant Prairie using untreated carbon. That was -- that showed -- that's when people discovered that on western coals, untreated carbon wasn't particularly effective at getting high levels of mercury removal.

Just to go back and close the loop on Pleasant Prairie, people went back with -- with a

slip -- doing a slipstream test and that test produced -- produced 90 percent removal on a slipstream test using halogenated sorbents, so rather than go back and do a whole -- a whole full scale test, which is costly, they went back with the halogenated sorbents to see how it would go -- perform at the same site where they had so much trouble with the untreated sorbents.

HEARING OFFICER TIPSORD: Mr. Forcade?

MR. FORCADE: Were any other tests in Table 8.1 pilot studies?

DR. STAUDT: I would have to look at table -- at the table. 8 -- well, actually 8.1 -- these are -- 8.1, that table is all field -- full scale tests, okay, but with Pleasant Prairie, I'm not using the untreated carbon results to form my opinion. I'm using -- which would -- were done at full scale. I gave you that information because that's one -- I'm giving you the information on the test that performed my post -- Pleasant Prairie is the only slipstream that I'm referring to and that -- the Pleasant Prairie slipstream it does not -- is not shown on Table 8.1, so that probably, you know, that

probably didn't -- that shouldn't have been included in the answer because you're only asking about things on Table 8.1.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Just for clarification, I think we agreed you would talk about those that you relied on --

DR. STAUDT: Yeah.

MR. HARRINGTON: -- that are on 8.1 are not -- but I'm just wondering that are not -- or not didn't rely on makes more sense.

DR. STAUDT: Yeah.

HEARING OFFICER TIPSORD: Mr. Zabel?

CHAIRMAN GIRARD: Dr. Staudt, I have a question in -- are you saying here in Table 8.1 you based this information on those four references that you have cited at the top, or did it come from anywhere else?

DR. STAUDT: There could -- Did I form my opinions based upon --

CHAIRMAN GIRARD: You cited --

DR. STAUDT: Yes, yes, those are references.

CHAIRMAN GIRARD: I can find three of those in the list of references in the back, but I don't find Kang (phonetic) at all, so we need a full reference on that.

DR. STAUDT: Okay.

CHAIRMAN GIRARD: But the other three all appear to be conference presentations, is there a report somewhere and how would we access it?

DR. STAUDT: There are reports on all of the department -- I assume that most of these are Department of Energy tests, demonstrations and they would -- you'd have to go to DOE's Website to get the -- the information on all of these. Those reports are available at DOE's Website. I haven't read the final reports on each one of these tests, but I have shown on Table 8.1 but I've read the conference papers -- the conference papers and in some cases the project -- the DOE project reports on some of the tests that I -- I reference here, that I used to form my opinions I should say.

CHAIRMAN GIRARD: Well, Mr. Kim, is it possible to get a citation for that Website to

get us to these sources, please.

MR. KIM: We'll try and get that for you, yes.

CHAIRMAN GIRARD: Okay.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Have you finished your list? I have three: Meramec, St. Clair, Pleasant Prairie.

DR. STAUDT: Yeah, there's -- well, there's Stanton 1 and Stanton 10. Those are actually north coal lignite and which is 170 megawatts, and that's and that's --

MR. HARRINGTON: Which one is that?

DR. STAUDT: Stanton 1. Oh, that's subbituminous, that's right. I have -- Somewhere in here I have the STA of Stanton 1. You may have it. Stanton 10 is 70 megawatts. It actually has a Spray Dryer Absorber, so what they did with that testing -- there's a piece of -- a duct work before the Spray Dryer Absorber and before the fabric filter and Spray Dry Absorber after the boiler. At Stanton 10 they injected the sorbent and they injected into the duct work

because with an ESP the capture is done what we call in flight. You inject the sorbent and it interacts with gas, captures the gaseous mercury, you know, at a later particulate removal device, that sorbent with the mercury on it is removed. So the actual removal of mercury from the gas stream occurs without an ESP, okay. You really -- the gas -- the ESP actually later just grabs the sorbent once the mercury has been removed from the gas stream.

So Stanton 10 there isn't even an ESP in the testing because they measure upstream from the injection point, and they measured mercury downstream the injection point and they got high removal rates. So there isn't an ESP at Stanton. Laramie River, 550 megawatts, that's lignite that has an SCA of 599, 600.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: I realize it's getting late but I might have missed something. At Stanton 10 there was no ESP to particulate removal?

DR. STAUDT: There -- No, the test --

the test was conducted full scale. It was -- just measured -- you were measuring in the duct, in the same duct that the injection occurs at an upstream -- the measurement was occurred at an upstream point and the downstream point while the sorbent was being injected prior to reaching the Spray Dryer Absorber. Now -- So there wasn't an ESP, but what's important is mercury removal when you have an ESP. Their mercury is removed from the gas in flight, okay. There's -- The gas -- the mercury is in the gas phase --

HEARING OFFICER TIPSORD: I appreciate you wanting to talk to us but when you turn to us, you turn away from the microphone.

DR. STAUDT: Oh, I'm sorry. The mercury exists in the gas phase and the sorbent is used to draw the mercury out of the gas phase. That's the purpose of the sorbent. And then the mercury is on the sorbent and then it's captured by an ESP. So the actual removal of mercury from the gas phase occurs what we call in flight. It doesn't -- With an ESP it doesn't occur in ESP. The ESP just grabs the sorbent and takes the sorbent out, okay. So that shows that the --

frankly, this whole notion of -- is SCA important? Not in terms of removing the mercury from the gas phase, okay. That's all this talk about SCA and size of the ESP doesn't matter. The mercury is removed from the gas phase prior to entering that ESP.

MR. HARRINGTON: Mercury is removed from the -- Back up. We're dealing with three types of mercury: Flue gas, particulate, elemental --

HEARING OFFICER TIPSORD: Mr. Harrington, you need to move closer to the microphone.

MR. HARRINGTON: Am I correct that the three types of mercury in the gas stream: Elemental --

DR. STAUDT: Oxidized.

MR. HARRINGTON: Oxidized?

DR. STAUDT: And particulate.

MR. HARRINGTON: And particulate. So when the sorbent absorbs the mercury, it's still -- until that sorbent is taken out of the gas stream, the mercury is still there. It's just changed form, am I correct?

DR. STAUDT: It's converted to particulate mercury.

MR. HARRINGTON: Converted to particulate mercury. So it's not removed. It's converted, changed in form. And then that form has to be removed in the gas stream in order to achieve mercury removal?

DR. STAUDT: Well, that -- that's true.

MR. HARRINGTON: So when you say they measured mercury upstream and downstream of the point of injection, what mercury were they measuring?

DR. STAUDT: They were measuring gaseous mercury, total oxidized, and elemental.

MR. HARRINGTON: But not particulate?

DR. STAUDT: Not particulate. Which we know that whether you use an ESP or a fabric filter you want to catch the particulate. That is not -- Removing particulate mercury is easy. It's already -- it's already occurring without any -- that's the co-benefit removal that we talk about with existing ESPs in fabric filters.

HEARING OFFICER TIPSORD: Ms. Bassi,

follow-up?

MS. BASSI: With respect to Stanton 10 on Table 8.1, which is what we're talking about; correct?

DR. STAUDT: That is correct.

MS. BASSI: Stanton 10 is listed twice, one time -- and the second time it indicates the Cold-Side ESP. And I thought you said there was not an ESP at Stanton 10, did I mishear you?

DR. STAUDT: Oh, yeah, that -- that was basically the -- what I call the simulated -- it's an in flight removal when I say -- they don't have a Cold-Side ESP but that's the data I was referring to -- that citation is what the second to last one in Table 8.1, that is -- that is a -- what I would call maybe a simulated Cold-Side ESP because it was -- was -- what is really in flight removal.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: I would like to go back to Mr. Harrington's question and your answer -- more specifically your answer to it. I think what I heard you say is, is that you don't catch the

elemental mercury and you don't catch the gaseous -- or the RGMs, all you catch is the particulate mercury but those other two species of mercury are changed to particulate mercury; is that correct?

DR. STAUDT: No, I think you're -- I'm not sure what you're saying. Let me explain to you what happens.

MS. BASSI: I wasn't either.

DR. STAUDT: All right. The mercury exists in the gas stream normally in three forms: An elemental form, an oxidized form, and a particulate form. Normally the only kind that are -- that can be removed is particulate mercury is that basically particulate means it's already attached to the fly ash, okay. It's already solids in there -- there's already solids in there and it's already attached to the fly ash. And we have particulate removal devices on all the boilers that take that fly ash, capture that fly ash so that particulate removal -- that particular mercury rather is already removed. That's what we call a co-benefit removal. The trick is removing the oxidized and elemental.

If you have an Wet FGD system, the oxidized mercury, most of it gets captured pretty well. Elemental mercury you have to convert it to another form to capture it.

Now what sorbent does is sorbent enables you to turn that oxidized and that elemental mercury into particulate mercury. So essentially what you're doing, that oxidized mercury and that elemental mercury that exists in the gas phase, they get attached to the carbon, okay, that you inject, the activated carbon. And then that activated carbon is just with -- with the 98 -- 98.5, you know, percent of the other material, that's solid material, gets captured along with all that fly ash in an ESP or fabric filter. So, you know, the carbon -- the carbon grabs at the remaining -- those gaseous forms of the mercury, turns them into particulate and then the ESP catches them.

MS. BASSI: As the carbon is grabbing the elemental gaseous -- and RGM, is there a chemical reaction that occurs to turn them into the particulate form of mercury?

(Cell phone rings.)

MS. BASSI: Do you want me to repeat the question?

DR. STAUDT: Repeat the question, please.

MS. BASSI: Okay. What I want to know is, is there a chemical reaction or some -- I think chemical reaction is probably the right term, that occurs that turns the elemental and the oxidized mercury into particulate mercury when it -- when the carbon is -- when it's exposed to the carbon?

DR. STAUDT: It's called Chemisorbtion, C-H-E-M-I-S-O-R-B-T-I-O-N.

MS. BASSI: Okay. So there's not -- there's not really then -- they aren't altered in their species from elemental to particulate, it's just that the carbon causes it to stick?

DR. STAUDT: It gets bound in a -- with a chemical -- there is a chemical reaction but chemically bound to the carbon.

MS. BASSI: Is it elemental mercury still?

DR. STAUDT: No, it's not elemental. It's particulate mercury.

MS. BASSI: So there is a reaction and it does change it's species?

DR. STAUDT: Yes.

MS. BASSI: Is that correct?

DR. STAUDT: Yes.

MS. BASSI: Thank you.

HEARING OFFICER TIPSORD: Mr. Forcade?

MR. FORCADE: Dr. Staudt, I believe you mentioned that most of the tests that were run were run either supervised by or sponsored by the Department of Energy?

DR. STAUDT: Yes.

MR. FORCADE: How would you summarize the Department of Energy's view on halogenated activated carbon injection? Would they describe it as a promising but not demonstrated technology or have they described it as a -- would they describe it as a promising but not demonstrated technology or would they describe it as a demonstrated technology that should be employed quickly?

DR. STAUDT: I really don't know exactly what they -- what their position is so --

HEARING OFFICER TIPSORD: Anything

further? All right. Then I think we're ready too move on, but quite frankly, did we get all of 45 or did we get caught in the middle of 44?

MR. HARRINGTON: I think we were caught in the middle of 44, unfortunately.

HEARING OFFICER TIPSORD: Hold on. Ms. Tickner?

MS. TICKNER: I guess maybe I just had one follow-up or I missed it. On 8.1 I think Dr. Staudt only describes the test he relied on for the PRB coal, was he going to talk about the testing he relied for high sulfur coal?

DR. STAUDT: Well, for high sulfur coal -- let me talk about bituminous coals in general as opposed to high sulfur because as I mentioned in my testimony there isn't good data on high sulfur bituminous coal, and I'm not -- there isn't good information on high sulfur bituminous coal so -- but for the low to medium --

HEARING OFFICER TIPSORD: Dr. Staudt, you're turning away from the microphone.

DR. STAUDT: I don't -- None of these tests were high sulfur bituminous coals, okay, at

least high sulfur in the respect that we have high sulfur here in Illinois. And as I mentioned, they're really only -- they're four small Meredosia units and there is the -- and possibly Hutsonville that are high sulfur. There are a couple of low to medium sulfur units and units that I would say are comparable to those units would be the Allen, Monroe, and Lausche all are bituminous. Allen is 165 megawatts with an SCA of ESP is 460. Monroe is 785 megawatts. It burns 60/40 bituminous PRB blend but has similar SO2 emissions as -- as some of the -- as some of the medium -- low to medium sulfur bituminous units here in Illinois, and its ESP has an SCA of 258. Lausche is a bituminous unit, actually a fairly small, 18 megawatts with an SCA of 370. Lausche is probably the -- of those three the highest sulfur and certainly had probably higher SO3 levels than the others.

MS. TICKNER: And what level of SO2 would that be?

DR. STAUDT: At Lausche about 1,000 PPM as I recall, 1,500 PPM. So as I indicated, for the very high sulfur unit I, you know, there

isn't a good test data on sorbent injection.

MS. TICKNER: Are you aware that there are couple of permanent (phonetic) units that aren't constructed yet that have way higher levels of SO2 than we're talking about here?

DR. STAUDT: Well, I'm aware there are -- there are new -- new construction units proposed, is that what you're --

MS. TICKNER: Yes.

DR. STAUDT: I don't know the details of those new construction units but I have been told based upon the equipment that I'm told that they are going to have -- they, you know, it's hard to imagine -- my understanding is that the -- if we're talking about the -- it will have wet -- it will have these -- will have SCR and Wet FGD and I would expect that they would get -- with a modern, you know, modern SCR and Wet FGD and possibly even more controlled beyond that if -- I know some may have Wet ESP, they're going to get -- going to comply with the rule. It's hard for me to imagine a scenario were they don't.

MS. TICKNER: Would you be surprised that vendors weren't willing to guarantee 90

percent removal for mercury on that unit with all that equipment?

DR. STAUDT: You know, I don't get involved in -- guarantees are negotiated and they -- there are lots of -- I used to sell the equipment so I know a lot about how the whole guarantee negotiation process goes and, you know, it's usually -- it's not a simple negotiation. But I can't speak to what would happen on a particular unit, what companies are willing to guarantee.

MS. TICKNER: Thank you.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: Would Mr. Nelson guarantee that?

DR. STAUDT: That question, I assume, is for Mr. Nelson?

MS. BASSI: Yes, sir.

MR. NELSON: I have some questions on guarantees that I can explicitly address. Since we don't make scrubbers, I'm not willing to guarantee scrubbers. Scrubber guarantees are a little more different in the sense that they're large capital equipment. And if you're getting

89 percent or 85, it may be very expensive if you're making big physical changes to get 90. Where Sorbent Technology, it just really means you usually have to inject a little more sorbent than you thought. So it does not surprise me that B & W or Alstom are not going to -- are going to be problematical in making those guarantees particularly since what's the utilities alternative. They only -- the guarantee is really kind of you only do what you have to do to get the order.

MR. HARRINGTON: One point of suggestion the record might be unclear, are we talking about the test on maybe -- Put this way. Talking about the mercury removal, we talked about the fact that mercury that's elemental or the reactive gas or oxidized, as you called it, is captured on the activated carbon, you're not suggesting that 100 percent of it would be captured and -- on the activated in any case, are you? I mean, no matter what process it is, you're not capturing 100 percent of the mercury, the gaseous and elemental mercury on the activated carbon or halogenated activated carbon?

DR. STAUDT: Of the mercury that is captured, basically if 90 percent -- if you get 90 percent removal of the gaseous form of mercury, okay, overall, that 90 percent is occurring prior to the perforation plate of the ESP. Once it gets into the field, once it enters that first field, almost most of the carbon gets removed, okay, and so I don't know how it's getting -- if you pull the carbon out of the gas stream, it can't be removing the mercury that's in the gas stream.

MR. HARRINGTON: Well, I was saying -- maybe put it another way. Just taking the activated carbon -- the halogenated activated carbon injection system before the ESP in a particular device, mercury coming in to that treatment system will be in the three forms that we discussed; correct?

DR. STAUDT: Mercury coming into?

MR. HARRINGTON: The treatment system. Where ever you inject the activated carbon?

DR. STAUDT: It would be -- Yeah, in the three forms.

MR. HARRINGTON: And the purpose of

injecting the halogenated activated carbon or plain activated carbon is to capture the elemental mercury and the gaseous mercury onto the activated carbon?

DR. STAUDT: Well, the elemental and the oxidized which are both gaseous.

MR. HARRINGTON: Yeah, both on the activated carbon before it goes into particulate removal system?

DR. STAUDT: That's correct.

MR. HARRINGTON: Some elemental and reactive gaseous mercury is going to go -- is not going to be captured in that process; is that correct?

DR. STAUDT: In which process? Prior to the ESP?

MR. HARRINGTON: Prior to the ESP or after the ESP? When you go through that whole treatment, some gas is going to come out the other side?

DR. STAUDT: Well, look. When you say that there's 90 percent removal of that, and that's what we're talking about, 90 percent removal of that gaseous -- if you're removing 90

percent of the gaseous mercury, which actually means you're removing more than 90 percent of the total mercury, okay, because -- because it's that particulate mercury that's being captured anyhow. When you're removing 90 percent of that gaseous mercury, there is that 10 percent you don't catch and that's --

MR. HARRINGTON: I just wanted to make that obvious and that's when you go through --

DR. STAUDT: That's going to go right through.

MR. HARRINGTON: And some of the particulate mercury that started out in the system is going to go through as well?

DR. STAUDT: Very, very little.

HEARING OFFICER TIPSORD: Mr. Romaine, you have something to add?

DR. STAUDT: ESP is pretty efficient. You know, for a fabric filter it's virtually none. But an ESP in particular, you know, we're talking about ESPs here because on fabric filter some of the removal does occur on the filter, but on the -- within the particulate removal device, but an ESP all the capture occurs before the

perforation goes to the ESP.

MR. HARRINGTON: I don't think we're arguing or betting the point. I think there was -- some people thought there was a misimpression on the record that everything was captured on the carbon. I know that wasn't your intent to say that. We just wanted to clarify the record.

MR. ROMAINE: To clarify that comment -- on Mr. Staudt's comment, the assumption that USEPA has made in CAMR is that it's not necessary to quantify particulate matter emissions coming out of the stack. The emissions monitoring that's required on CAMR and proposed rule simply goes after these uncaptured gaseous mercury.

MR. HARRINGTON: So let's make clear then that the intent of the Illinois rule based on what you've just said is to have -- you're going to have a sampling device which is only going to measure the gaseous mercury coming out the control system?

DR. STAUDT: I can't speak to the intend of the Illinois rule.

HEARING OFFICER TIPSORD: Mr. Romaine can answer that question.

MR. ROMAINE: That is the monitoring methodology that USEPA has developed, and I saw Mr. Nelson nodding his head conferring that.

MR. HARRINGTON: Well, I think the record should be clear that's -- that's the monitoring system, but it also means that for the future there is no intent that any particulate mercury comes out of the control system, if there is any, is going to be accounted for as being uncaptured or 90 percent system or accounted to the .008?

DR. STAUDT: Just as a clarification, right now there already may be some sort of particulate matter that may escape the ESP, but keep in mind, there's already mercury on your fly ash as it is, particularly if you have -- so you're not really changing anything.

MR. HARRINGTON: No, I -- we don't have -- we don't have a debate on that point, but I'm getting back to Mr. Romaine's point, the 90 percent capture is not talking about the particulate mercury?

MR. ROMAINE: That's correct. And in terms of addressing the particulate matter, LUST

will have programs and future discussions will be addressing additional control methods for particular to that method.

MR. HARRINGTON: I understand there will be particulate control programs. We understand that. But I think the rule should be clear as to what it is for limiting and measuring coming out because we know test methods are changed and there is our famous incredible evidence rule of about what you're measuring coming out, so the rule should be very clear about that. And sorry I'm lecturing but I'm just trying to make sure the record is clear.

HEARING OFFICER TIPSORD: Let's take a break.

(A short break was taken.)

MR. HARRINGTON: I was going back to 44(c) which we haven't -- we've never answered the question.

MS. MOORE: Okay.

MR. HARRINGTON: And in light of Mr. Romaine's clarification of the monitoring, which I probably should have realized but perhaps didn't, I think 44(c) becomes a more important

question given than what I originally thought of. What measurement methods were used to determine removal rates while inlet and outlet for the test that you're relying on the -- for the ones that you're relying on?

HEARING OFFICER TIPSORD: Again, for the record we really have gone afield, referring to the demonstration catalog table at 8.1 on page 125 of the TSD; is that correct?

MR. HARRINGTON: Correct. And then by agreement we limited to those tests. Demonstrations that the witness relied upon.

HEARING OFFICER TIPSORD: Correct. Thank you.

DR. STAUDT: Well, my understanding on most of these they used continuous mercury monitors for most of the tests. I can't speak to the details on each one. But, again, they were done by the U.S -- these were -- tests were supervised U.S. Department of Energy.

MR. HARRINGTON: Do you know -- you don't know what continuos emission monitors they used?

DR. STAUDT: On ADA they used a

monitor of -- test by ADA used monitors from Thermal Electron Corporation. Sid can speak to the ones that are -- that are done on the test that he was involved with.

MR. HARRINGTON: Yes, please.

MR. NELSON: We actually, in our programs, we measure mercury four different ways. You want to measure it as many ways as you can. From day to day we use the continuous mercury monitors. Ours are called Sir Galahads. It's actually serial numbers one and two of a new unit that is going to be marketed by GE. It comes out of Brittain. We also use particularly more recently usually every day or every other day we will do a sorbent trap called -- used to be called Method 324. It's now appendix K, an alternative scheme that Electric Power Research Institute, EPRI, uses. DOE requires us to occasionally do a more elaborate method that gives you just a snapshot called the Ontario Hydro Method, and we have a contract that will come in and do that. We actually have an outside firm in our DOE programs do our continuous mercury monitors because we don't want to look

like we're biased in doing measurements. And, finally, and the thing I have the most faith in is we take those fly ash samples every day, the long-term ones, as well as sampling the mercury in the coal and that way we can get what we call a mass balance to know how much mercury is coming into the plant, how much is mercury is going out the stack, how much we're actually taking out in the sorbent that isn't a fly ash, and we can kind of sum it all up and figure out where everything goes. It's a real good way to make sure you're getting the mercury removals that you think you are.

MR. HARRINGTON: With respect to measuring the mercury in the flue gas either before or after treatment, do you use continuous emission monitors such as Sir Galahad or the others you mentioned, do those sample only the gaseous mercury?

MR. NELSON: The Ontario Hydro Method gives you a particulate but the continuous mercury monitors can measure gas phase. Same with the Method 324.

MR. HARRINGTON: So when somebody says

they removed 90 percent mercury in the gas, the assumption -- in the flue gas, you have to know what test they're using before and after the treatment in order to know what that 90 percent is of?

MR. NELSON: Yeah. The particulate associated mercury -- we call it particulate associated mercury rather than particulate mercury. It's not -- the mercury is in different forms. The mercury -- Once it's burned in the boiler, it only is there in gas phase. It's either in oxidative state or it's an elemental state. It's only a gas phase. That native removal what we call it, that's that accidental. You'll notice, for example, on the one exhibit of St. Clair, there's actually two numbers here. It says the 30-day average removal due to the sorbent is 91 percent whereas the 30-day average is 94 percent.

It is important to kind of distinguish between these two numbers. At some plants where you do have high accidental removal or particulate phase removal, that difference in 3 percent, the way to think about it is that this

plant, if we don't have any sorbent injection on, will get out 20 or 30 percent of the mercury without even trying and that's absorbed on the unburned carbon that's in the fly ash. So the way to think about this is when we injected the sorbent, we got 90 percent of -- 91 percent of the gas phase mercury that was there when we injected the sorbent and then the unburned carbon that was already there gets another 20 or 30 percent of what's leftover. So in that case it's 20 or 30 percent of 10 percent or 2 or 3 percent, so that's the difference between 91 and 94. When you look at these numbers and you look at how much is removed, we always report the mercury removal due to the sorbent because that's something you can generalize going from plant to plant whereas each plant is going to have anywhere from zero percent of native removal to as high as 95 percent without any sorbent injection. So it is important to distinguish to say exactly what you're talking about. Is it removal due to your sorbent or whatever technique you're doing or is it total, you know, and you're taking credit for what the plant is doing even

without you?

HEARING OFFICER TIPSORD: I would note for the record Mr. Nelson was referring to Exhibit 49.

MR. HARRINGTON: Now when you say you get 90 percent removal on certain tests and expect to get that in the future with the technologies we've talked about, are you talking about 90 percent removal of the gaseous mercury? And let me ask Mr. Staudt -- Dr. Staudt this question because I want to clarify what the 90 percent is of.

DR. STAUDT: Well, if you're getting -- Yes. I mean, you can see 90 percent of the gaseous mercury. For example, let me just, you know, to clarify this. If you have, let's say, we've heard about co-benefit removal. The co-benefit removal is basically how much the mercury, as you mentioned, some mercury gets attached to the fly ash. And it's, say -- and just to make the math easy. Let's assume that 50 percent of the mercury that goes into -- is in the coal gets attached to the fly ash. So you get a 50 percent co-benefit removal. To get to a

total of 90 percent removal, all you have to do is remove 80 percent of the remaining 50 percent to get to a total 90 percent removal. So if you're -- the -- actually it's good when you have a lot of mercury on the particulate already because then you don't have to -- you don't have to inject as much sorbent to get 90 percent total for the -- for the amount that's in the coal because already -- already a lot of that mercury -- that mercury from the coal is already going to be pulled out from the ESP. You're just going after what the -- part that's remaining part.

MR. HARRINGTON: Just for clarification, with respect to subbituminous coal, Powder River Basin coal that's typically used here, the removal on the fly ash is much less than it is on bituminous?

DR. STAUDT: That's correct.

MR. HARRINGTON: And 20 percent or less would not be uncommon?

DR. STAUDT: Oh, that's correct. And in my, you know, and actually I'm presuming that in nearly every case for the PRB units that there's no co-benefit.

MR. HARRINGTON: Okay. I think that should be clear. But in terms of the 90 percent removal on subbituminous coal, we're talking about looking at gaseous mercury in before the treatment after gaseous mercury out after the treatment essentially ignoring particulate on both ends?

DR. STAUDT: No. I mean, basically the -- if you're capturing -- when we look at 90 percent removal by sorbent, okay, the sorbent doesn't remove -- doesn't remove mercury that's already been on fly ash. So it's basically -- when I talk about 90 percent removal attributed to the sorbent is 90 percent of -- it's really you're comparing gaseous mercury prior to treatment to the gaseous mercury after treatment.

MR. HARRINGTON: For clarification if we have a rule that says when you take out 90 percent mercury when you measure it coming out of the system should be gaseous mercury ignoring any particulate?

DR. STAUDT: Well, anything having to do with how the rule requires people to measure mercury, that's, you know, maybe Chris.

HEARING OFFICER TIPSORD: I believe Chris Romaine answered that question yet a couple of times.

MR. HARRINGTON: Well, he answered in terms of the specified in some of the test methods, but Ontario Hydro is one of the reference methods that measured particulate.

HEARING OFFICER TIPSORD: All right. Go ahead, Mr. Romaine.

MR. ROMAINE: I'm simply going to respond by saying that the rule does not require 90 percent control. Nothing in this rule says 90 percent control. If in terms of how compliance is determined, it has a provision that requires that the amount of emissions be no more than 10 percent of the mercury going into the unit. So think about it in terms of the other part of the equation. The emission can be no more than 10 percent of what you started with. Maybe it's gaseous mercury coming out of the stack.

MR. HARRINGTON: Gaseous mercury. In test methods that you've specified would be gaseous mercury would not include particulate; is that correct?

MR. NELSON: If I can clarify, Ontario Hydro which measures the particulate, all the Ontario Hydro methods that I've seen where they sampled after the particulate removal device, there's never any mercury in those unless it's a bad sample.

MR. HARRINGTON: Are you aware -- Go ahead.

MR. ROMAINE: I wanted to clarify. Obviously the rule starts out with a 90 percent reduction requirement. But that's partly the reason why the rule very quickly goes to specific methodology for how emissions are calculated which take the input mercury and calculate allowable emission rate that is 10 percent of the input mercury.

MR. HARRINGTON: And that outlet mercury is going to be measured using methods that only measure gaseous mercury?

MR. ROMAINE: That is the nature of continuous monitoring method.

MR. HARRINGTON: And no other method will be applied?

MR. ROMAINE: We have not specified

using another method.

MR. HARRINGTON: And the record can be clear and maybe the opinion that's what we're talking about. But are you aware, Dr. Staudt, of a system where the mercury measurement of 90 percent number, or removal number we've spoken of, it has been based on measuring the mercury in the coal versus the mercury in the discharge from in the plant?

DR. STAUDT: It would -- it would actually be easy -- it actually is easier to get to -- because you're starting out with more in the coal, so the highest amount of mercury starts out in the coal so if you're starting out at a higher level, it's actually easier to get down to 10 percent of that higher level. So the way the Illinois rule is written, if you're comparing it 90 percent to what the outlet is or the uncontrolled outlet, that is actually much more stringent than 90 percent of the coal -- much more stringent than what the Illinois rule requires which is, you know, emitting no more than 10 percent of the mercury that goes into the plant.

MR. HARRINGTON: Are you aware of any sampling that has been done to make that demonstration?

DR. STAUDT: I don't know if that sampling has been done.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Was that D?

MR. HARRINGTON: Yes, I think that takes care of D.

HEARING OFFICER TIPSORD: And E, the length of each study that you relied upon.

MR. HARRINGTON: That, I believe, has been answered.

HEARING OFFICER TIPSORD: And F.

MR. HARRINGTON: F.

DR. STAUDT: Okay. I can't comment on the statistical methods others may or may not have used. I think the -- but you have -- you have -- the best fit curves with the -- with this Exhibit 52. So if you want to look at what I have done, I can't speak to what other people have done.

MR. HARRINGTON: Maybe you can correct me or if I'm -- it's outside both our areas of

expertise then we can just go on. But my understanding is when you take a set of data you want project future performance from that data, there's appropriate statistical methods to analyze it, simply drawing the curve tells you what you did have but is not a reliable method of predicting what you get in the future based on that same data. Do you understand?

DR. STAUDT: Perhaps you can give me -- describe some more and give me an example.

MR. HARRINGTON: Well, for example, when analyzing in the water program when setting effluent limits, they develop a statistical method that's projected future limitations saying it will achieve 95 percent, no more than 5 percent of the future samples will exceed this value with a 99 percent confidence. It's a much more elaborate statistical method, which I can't apply but I understand what the purpose is, because it takes into account the variability of the data, the amount of data you have against the amount of data you will have in the future in order to determine that. And I'm wondering if you know of any such kind of statistical method

that was applied to any of the data you're relying on?

DR. STAUDT: Well, the curve that you have -- have it shows the -- the correlation and -- are squared. And from that you can develop -- you can develop confidence intervals.

MR. HARRINGTON: But you have not done so and are not aware of anyone else who has done so; is that correct?

DR. STAUDT: Well, I can't speak to what anyone else may have done.

MR. HARRINGTON: I'm not saying you can say they did or didn't. I'm just saying --

DR. STAUDT: But you can see what I've done and --

MR. HARRINGTON: Okay. Thank you.

HEARING OFFICER TIPSORD: G.

DR. STAUDT: "Whether the conditions upon which the study was run are comparable to those conditions that would be expected in a year-round operation under normal operating conditions." In my -- Based upon what I have seen, yes.

MR. HARRINGTON: Well, for example,

were these samples run in severe winter weather?

DR. STAUDT: Well, to my understanding they were using -- in most cases they were using continuous monitors.

MR. HARRINGTON: If you run a 30-day sample, when would -- a 30-day trial, typically when would that have been run?

DR. STAUDT: I don't know. I -- It would have been run -- would have been run over a 30-day period but I'm not sure what you're trying to get at.

MR. HARRINGTON: You don't know whether it was run in June or in January in this unit, for example?

DR. STAUDT: Well, one thing that's very important to keep in mind, if you take a look at Figure 8.10 of the data, one thing you will find is these are units that have different units and in all but one case they're all burning PRB coal, and different places in the country, different SCA, ESPs, and they all get pretty close to the same result. So when you get a series of data like that and over and over you go test here, you test there, you test someplace

else looking at, you know, boilers that, say, have certain characteristics you look for certain characteristics, PRB coal, Cold-Side ESP, what have you, and you get pretty much the same results time and time again, it gives you a pretty good level of confidence that in the future on a similar unit with those similar characteristics you will get pretty similar results.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: Intuitively it would seem that units would operate differently in summer than in winter, and I think that the question is: Have these over the gamut of -- at least over the gamut of the test that you relied on, do they reflect different seasons of the year, different -- different extreme weather conditions?

DR. STAUDT: Well, they also -- well, I don't know about --

MS. BASSI: Just yes or no or I don't know.

DR. STAUDT: Very different locations too.

MS. BASSI: Fine. But what about --

DR. STAUDT: Different climates.

MS. BASSI: -- what about seasons?

DR. STAUDT: I don't know about the seasons, what time of year they were run.

HEARING OFFICER TIPSORD: Mr. Forcade?

MR. FORCADE: Are we going to get the reports on these and, if so, would they have the date of the test?

DR. STAUDT: I am quite certain that your experts there have the information. They're cited in the TSD. These are all things that have been presented at places like the mega symposium and are available on the DOE Website?

MR. FORCADE: I'm interested what's in the record here. Are the reports that substantiate the tests you're relying on going to be produced into the record here? I believe the answer to that earlier was yes.

DR. STAUDT: We have the Website location.

MR. FORCADE: Well, I believe both I and Dr. Girard asked for the reports.

MR. KIM: I'm sorry. We have been looking for a Website address or a complete copy

of the reports, and we have not been able to find them yet. So we'll probably talk with Dr. Staudt a little more and see if we can get some more -- if we can find them, we will provide them but thus far we haven't been able to find them. And I haven't had a chance to talk about this with Dr. Staudt after we come back because we have been looking. Whatever information he has used to base his opinions and prepare the information to the extent it's not already provided, we will provide. It's just -- To be honest, we thought we had everything that was relied upon. If there is something that was missed or something that goes beyond that which we submitted to, we're going to try as hard as we can to get that.

HEARING OFFICER TIPSORD: I think the concern is if I may, Mr. Forcade, I think the concern here is not necessarily just what Dr. Staudt relied upon, but he is reporting results that we don't have all the information now on the results and he's used the results to form his opinions. He's given us more detail on the actual things he's relied upon, but we do have results here that have been presented as part of

the TSD which presumably supports the rule that we don't have enough information on.

MR. KIM: Right. But I believe that his testimony, and again, he can correct me if I'm wrong, I think with the exception of one of the four studies that was listed, his information was based upon slides and so forth that we have provided. So up until now we have given everything that we had that he has used with the exception of this one report to base -- to base the preparation of the TSD. But having said that, you know, if there are full reports and if Dr. Staudt has additional information that goes beyond what we provided, we'll definitely try to track it down and get it as soon as we can.

HEARING OFFICER TIPSORD: Thank you.

MR. KIM: If we have it, we'll get it to you.

MR. NELSON: If I can just interject on the seasonal data, I can only speak for Sorbent Technologies. But these were some of the questions I was asked, it might be better to talk about them here. The Lausche demonstration in that list, the Duke Power Cliffside and the Duke

Power Allen were all done in the winter, oh, as well as the Progress Lee, so those were done in the very cold weather. The Duke Power Buck, my company did in the spring time. The fall was Duke -- the fall Detroit-Edison St. Clair was done in the fall. Great River Energys Stanton 1 was done in the fall and we did one that isn't reported here. It was a fabric filter mercury reenforced steel plant was in the fall. In the summertime was we did one at Public Service of New Hampshire and our upcoming one that we begin next month or in July at Crawford here in the Chicago area will be the summer. That's my company. I know ADAS and URS similarly. We don't restrict them. We just do them, you know, any time a year because they're operating any time of year.

HEARING OFFICER TIPSORD: Ms. Bugel?

MS. BUGEL: Mr. Nelson, in your experience with those studies, does the weather affect the performance of sorbent?

MR. NELSON: The weather does not affect the performance of the sorbent. There's no reason to believe that it would.

MR. KIM: Going back to the studies, as I said, we will make every effort we can. We would certainly welcome, if for some reason someone else has though studies, we would be more than happy for them to provide them as well but we will -- we will try and find them.

HEARING OFFICER TIPSORD: Thank you, Mr. Kim. We ready to go to H. I'm sorry. Mr. Zabel?

MR. ZABEL: Simple question, Doctor, the Table 8.1 under equipment, some of them you list as CS ESPs and some of them you list as simply C-ESP, what's the difference?

DR. STAUDT: There shouldn't be a difference. That's probably a typo.

MR. ZABEL: They all coincide?

DR. STAUDT: Let me take a look just to make sure.

MR. ZABEL: Sure.

DR. STAUDT: Yeah. That would be cold -- where it says -- on the second page CE-ESP and independent, those are all Cold-Side ESPs.

HEARING OFFICER TIPSORD: Mr. Bonebrake?

MR. BONEBRAKE: One other follow up. Figure 8.10 which we were talking about a minute ago --

DR. STAUDT: Yes.

MR. BONEBRAKE: -- it refers to in flight mercury?

DR. STAUDT: That's correct.

MR. BONEBRAKE: And just in keeping with the distinction, we've been discussing between reactive, between gaseous and particulate mercury, does Figure 8.10 then depict reductions in gaseous mercury without regard to particulate mercury?

DR. STAUDT: That's correct. It's not -- particulate mercury is already removed so there's not -- by the particulate controlled device so kind of meaningless to talk about it.

HEARING OFFICER TIPSORD: Moving on, I believe we answered 8 -- or H. I'm really going back. Question No. 45.

DR. STAUDT: 45, well, we talked about which ones I used to formulate my opinions relative to Illinois rules. "Which of these units do you believe is representative of normal

operating conditions on facilities in Illinois including the size of ESPs and the use of gas conditioning?" The -- I mean, I can -- the test data shown in Figures 8.10 and 8.11 and the other data such as DT Monroe, which I think we'll probably provide, and the testing with fabric filters or TOXECON, were used to reach my conclusions on sorbent removal. It is my understanding that gas conditioning was in surface at Monroe during testing and no effect was observed.

I don't have information regarding the use of gas conditioning at the other sites. However, I -- SO3 conditioning can potentially have an impact on performance, and I'm sure we're going to talk more about that soon. The ESP, in my opinion, as I discussed the role that plays in removing of mercury, its only role is to capture the -- capture the particulate mercury once the sorbent has captured the gaseous mercury. So in my opinion ESP size is not a limit on mercury capture.

HEARING OFFICER TIPSORD: Question No. 46, I believe, we've answered about the length of

the study and your opinions, so let's go to.

DR. STAUDT: 47, "When dealing with new technology, isn't the minimum of one year of full scale operation necessary to project future performance?" I did not agree with that. Over 100,000 megawatts of utility coal capacity has been retrofitted with -- over 100,000 megawatts of utility coal capacity has been retrofitted over the last 10 years, and 10 years ago we had a lot less data on U.S. coals with SCR and U.S. coal than we currently have regarding the use of mercury sorbent on U.S. coal. SCR is also a form or complex retrofit than what we are talking about here with far bigger risks due to the high expense and use of catalyst that has to work inside the duct work for many years, you know, in contrast of that, the sorbent only has to work for a few seconds until it gets captured so I don't see -- I don't agree with that statement.

HEARING OFFICER TIPSORD: Mr. Zabel?

MR. ZABEL: Was the data on SCRs on foreign coal?

DR. STAUDT: The data -- the data was on foreign -- there was data on foreign coal.

MR. ZABEL: So when you say there was no data on U.S. coal, doesn't mean there was no data?

DR. STAUDT: Well, if -- there was plenty -- I can tell you 10 years ago there was plenty of complaining by the utility industry that SCR was unproven on U.S. coals.

MR. ZABEL: All I'm asking is your statement suggested there was no data on SCRs at the time that we installed wasn't quite accurate except when you limit it to U.S. coal; isn't that correct?

DR. STAUDT: Well, my statement was correct.

MR. ZABEL: As you limit it to U.S. coals?

DR. STAUDT: My statement was correct as I stated.

MR. ZABEL: You were not trying to imply that there was --

DR. STAUDT: My statement was correct as stated.

MR. ZABEL: I asked you another question. Read it back, ma'am.

HEARING OFFICER TIPSORD: You can't speak over each other. The court reporter can't take that down.

DR. STAUDT: I did not intend to imply that there was no data on SCRs.

MR. ZABEL: Good, then there was data as you said?

DR. STAUDT: There was data on SCR.

MR. ZABEL: Is there data on mercury controls on foreign controls?

DR. STAUDT: No. Because there hasn't been any testing to -- there hasn't been any requirement for mercury controls on foreign coal.

MR. ZABEL: Maybe my question wasn't clear. Has there been any use of sorbent injection in foreign countries on foreign coal?

DR. STAUDT: I'm not aware of any.

HEARING OFFICER TIPSORD: Question No. 48.

DR. STAUDT: 48, "You previously stated that SO3 in the flue gases would interfere with mercury removal from halogenated powder activated carbon; is that correct?" Well, I acknowledge that there is a potential for there

to be, and I don't know -- I don't remember saying exactly what you have in that question.

MR. HARRINGTON: I refer to the technical report you prepared during the public meetings when you talked about in the discussion was at public meetings where there was discussion of the impact SO3 originating from the coal, not SO3 injection, as interfering with halogenated activated carbon and potentially doing so?

DR. STAUDT: Well, I don't remember exactly what I said but I do acknowledge that SO3 can have an adverse impact on the performance of halogenated carbon in some cases.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: Question No. 49.

DR. STAUDT: 49, "Are you familiar with the use of sulfur tri-oxide as a gas conditioner prior to Coal-Side ESPs where facilities have been converted from high sulfur bituminous coal to low sulfur Powder River Basin coal (PRB)?" Yes. 50, "Are you familiar with the impact of such treatment on the performance of halogenated activated carbon?" I think we've

already answered that.

MR. HARRINGTON: Well, are you aware of any data showing the impact of SO3 conditioning?

DR. STAUDT: I have seen data, but I don't recall exactly the test results, but I've -- I have seen data.

MR. HARRINGTON: You don't -- do you recall whether it had a significant impact on removal?

DR. STAUDT: In some -- yeah, in some cases it did.

MR. HARRINGTON: By significant, perhaps as low as 50 percent removal as opposed to --

DR. STAUDT: Perhaps. Perhaps. I don't recall exactly.

MR. HARRINGTON: Okay. Thank you.

HEARING OFFICER TIPSORD: Question No. 51.

DR. STAUDT: 51, "What would you expect the impact of such treatment on the performance of halogenated activated carbon to be?" You wouldn't want to inject these together

or inject the sorbent downstream of SO3 because it could possibly hinder mercury capture as you point out. However, if the halogenated carbon can be introduced upstream of the SO3, any adverse effect may be avoided. In fact, what -- after I finish my answer, I think Sid has some -- some information to share with you. Some -- some Illinois units are likely to have adequate duct length to do that and avoid interference, others may not. However, in these cases there are alternatives to SO3 conditioning that are effective in a similar cost.

MR. HARRINGTON: Due to -- What alternatives are those?

DR. STAUDT: There are chemicals that are available from ADA. There are chemicals I'm told a company called Benetech and others. Basically these are alternative flue-gas conditioning chemicals that are not sulfur based and so -- and work -- work equally effectively.

MR. HARRINGTON: Are you personally aware of those?

DR. STAUDT: I am personally -- When you say personally aware, in what respect?

MR. HARRINGTON: Well, I mean, have you ever -- have you seen data on their application and the types of facilities that operate in Illinois with SO3 conditioning?

DR. STAUDT: Well, most of the facilities that they -- you would see data on, you would -- would be at similar facilities as Illinois people who shipped it from high sulfur to low sulfur coal. So, yes. I'm also aware it's my understanding that Midwest Generating uses an alternative approach.

HEARING OFFICER TIPSORD: Question 52.

DR. STAUDT: "How does the size of ESPs on Illinois coal-fired power plants compare to those in the studies referred to in the technical support document?" If you're referring to the size of ESP in terms of specific collection area, some of the Illinois --

MR. HARRINGTON: That's correct.

DR. STAUDT: Okay. Okay. Some of the ESPs are smaller than those in tests discussed in the TSD, some were of similar size.

HEARING OFFICER TIPSORD: 53.

DR. STAUDT: "How would you expect

that to impact mercury removal?" I do not expect ESP sites --

HEARING OFFICER TIPSORD: Slow down.

DR. STAUDT: Sorry. I do not expect ESP sites to have an adverse effect on halogenated sorbent performance at a properly designed, operated and maintained ESP, even a small one such as some of the Illinois units. The capture of gaseous mercury by the sorbent occurs before the ESP. ESP's role is only to capture the small amount of sorbent along with the tons and tons of fly ash that the ESP normally catches.

MR. HARRINGTON: Would you expect the condition of carbon to have any impact on the compliance with particulate and opacity standards on the small ESPS?

DR. STAUDT: There is a possibility that it could, but I haven't seen any evidence to see -- to show that it does have an impact. I haven't seen any data. I've seen test results on ESPs as small as a 144 SCA that is 144 and I am not -- I don't believe that the data shows any -- any impact.

HEARING OFFICER TIPSORD: Ms. Bugel?

MS. BUGEL: Dr. Staudt, is there -- hypothetically speaking, I know your expert opinion is that there shouldn't be an impact. But hypothetically speaking, if there is an impact on particulate matter or opacity, is there a mechanism in the rule to address such an impact?

DR. STAUDT: Well, there is a TTBS, okay. If somebody does have a problem getting -- if somebody does have a problem due to whether, it's SO3 conditioning or some other reason, some reason they have an emission -- emission problem that -- that may be -- may occur after they start sorbent injection, yes, there is a mechanism that TTBS will provide them what we might call a soft landing.

HEARING OFFICER TIPSORD: And for the court reporter you said a couple of times TTBS.

MR. HARRINGTON: We have a series of questions on that so I'll postpone any questions on that until we get to those questions.

HEARING OFFICER TIPSORD: Thank you. We ready to go to question 54 then?

DR. STAUDT: 54, "Can you state from your own knowledge or based upon information that you have reviewed what the expected mercury removal will be from facilities with ESPs similar in size to those in Illinois and sulfur tri-oxide conditioning following installation of halogenated activated carbon injection prior to the ESPs?" I believe that most units in -- most units with SO3 conditioning can address their concern through location of the sorbent injection through upstream of the SO3 injection or alternatively by changing to another gas conditioning method. The few that may have difficulty and need more time can use the TTBS. One thing that may be useful is Sid Nelson can talk about the -- he did some tests that -- that -- on units that had SO3 conditioning.

MR. NELSON: I have about six or eight questions that deal with this so I thought I'd like to delay it until we can kind of address it more.

DR. STAUDT: Okay.

HEARING OFFICER TIPSORD: 55.

DR. STAUDT: "Can you state what the

effect of the smaller ESPs common in Illinois facilities would be?" I'm not concerned about the small ESPs except where ESPs may already be very marginal. There are a lot of things besides -- besides collection area that effect the performance of an ESP. I'll go through a few of them. Some of them is hopper depth, the design of the hopper. The gas -- the particulate they drop from the plates, they collect in these hoppers, and I've seen people where they change to a different coal and the hoppers weren't deep enough. There are things like if you are -- if your fields are misaligned, if it's an old unit, there's a good chance fields are misaligned. There are problems where if you haven't refurbished your ESP in a while, you may have cracked insulators and you get poor performance in that reason. And the other thing that happens a lot of these units were built a long time ago before we had really good computation of fluid dynamic and the flows into them can be highly skewed. And, finally, in many cases there's a lot of carbon already going into these ESPs just from the coal already, the coal that doesn't

burn, so there's a lot of factors besides people focus on collection area, all other things being equal, I'm sure it's better to have more collection area but there are a lot of other factors that play into how an ESP performs.

HEARING OFFICER TIPSORD: Question 56.

DR. STAUDT: 56, "Is it true that you have no data which to predict mercury removal with halogenated activated carbon, I assume that's what HAC means, injection from smaller ESPs on Illinois coal-fired power plants either with or without sulfur tri-oxide conditioning?"

It is true that there is no data that I am aware for injecting sorbent before ESPs with an SCA less than 144, and some units in Illinois are as small as 100 or about 100. I think one of them my understanding might be 99. But lack of data neither proves or disproves anything since there is no data for an ESP as small as the smallest ones in Illinois. There may be a risk, okay, but I think the risk is small and it can be addressed by TTBS. Question 57.

HEARING OFFICER TIPSORD: Could you identify yourself?

MR. WANNINGER: Kent Wanninger, W-A-N-N-I-N-G-E-R. It's not on that list. Kent Wanninger, is that better, Midwest Generation. You mentioned one unit as small as 144 SCA was tested?

DR. STAUDT: Yes.

MR. WANNINGER: What plant was that?

DR. STAUDT: I think it was Yates 1 or Yates 2.

MR. WANNINGER: Yates 1. Do you know if they experienced any carbon carryover from the ESP on that test?

DR. STAUDT: Well, there are two tests. There -- the Yates 2, which is the one on the scrubber. The Yates 1 they didn't show -- there didn't show any, but Yates 2 there was some discussion of the possibility of carbon carry. Now I've examined that report and I think we probably want to enter it as an exhibit. I've examined that data in pretty good detail. There -- they have -- that unit has extremely LOI, I mean, on the order of about 15 percent already, and so lots of carbon is already in that ash.

HEARING OFFICER TIPSORD: LOI?

DR. STAUDT: Loss on ignition.

HEARING OFFICER TIPSORD: Thank you.

DR. STAUDT: And one thing for sure that unit has -- it was having problems -- it was having problems before that test and it was having -- before that was ever tested it was having problems after that testing. And one thing I will acknowledge, I don't believe that adding carbon will make a lousy, you know, a poor performing ESP necessarily work better. But with Yates they took a marginally ESP, tested it and they found low and behold we still had problems.

MR. WANNINGER: Did they experience that on both units?

DR. STAUDT: According to the -- the smaller unit, the one that was 144 FCA, the results presented at, I believe, the 2004 mega symposium said they found no evidence of any emissions problems associated with carbon injection. That was the smaller one which I think is the Yates 1. Yates 2, which is the larger the two, has SCA of 175. That's upstream of a -- of a jet bubbling reactor, a scrubber. That one there was some discussion of maybe they

had some arcing but I've looked at the arcing issue. I looked at the raw data. They had arcing problems before they ever injected any sorbent. There was an issue about -- there was concern about they found that -- they found that during a period of time they did find elevated inerts, what they thought were elevated inerts, in their -- in their jet bubbling reactor.

Well, if you look at the data, it shows that there are times when they're injecting it's low and times they're injecting -- they're not injecting it's high. It's basically there's really no consistency to the data. You don't derive -- you don't -- there's no correlation really. If you look at there's also some discussion I know about the Yates. There are people who said that, you know, discussed the arcing. We discussed -- oh, there's emissions and then if you look -- if you plot the data, if you look at the data they show, there's basically no correlation between the increased injection rate. They measure the emissions downstream of the ESP even at very high injection rate, sometimes they're above the baseline, sometimes

below the baseline and, in fact, they took four data points to establish a baseline, okay. They took 20 data points during the testing. Of the 20 they had a range of the baseline -- of that baseline they were six data points above the baseline range, six data points below the baseline range and eight data points within the baseline range and with no -- no correlation, you know, so I look at that and I say, well, that doesn't lead me to any conclusion to sorbent injection. So there's really no correlation there.

Basically they have ESP. They got the, you know, they had some problems with it. They tested it and low and behold still had problems. That's my read on Yates.

HEARING OFFICER TIPSORD: You said that you have the data on Yates and will provide it?

DR. STAUDT: Yeah. I think that's part of the DOE report. I can provide that information.

HEARING OFFICER TIPSORD: Thank you.

DR. STAUDT: Quarterly DOE report.

HEARING OFFICER TIPSORD: Thank you.

MR. WANNINGER: And that is the smallest SCA unit that you've seen data tested on?

DR. STAUDT: That's the smallest I'm aware of.

MR. WANNINGER: I know what you're saying. I think you're saying the results were inconclusive?

DR. STAUDT: Yeah. I'd say inconclusive except that it showed you're not going to get better performance, you know, your problems aren't going to go away if you have a bad ESP.

MR. WANNINGER: Thank you.

HEARING OFFICER TIPSORD: Thank you. Are we ready to go to question 57. Thanks.

DR. STAUDT: 57, "Based upon your knowledge of the treatment technologies and your familiarity to the extent you are familiar with Illinois coal-fired power plants, could you advise a client in Illinois to rely upon halogenated activated carbon injection prior to ESP as a technology to achieve compliance with

the proposed Illinois regulation?" I don't have any utility clients in Illinois. I guess I'm probably not enduring myself to them at this point so, but -- but if I did have utility clients in Illinois, what I would advise them would depend upon their circumstances. If injection of halogenated activated carbon upstream of an ESP seems like the least expensive approach to their circumstances, that's what I'd recommend. But there might be -- but I would not tell them not to explore other alternatives but I would if it was -- if I thought the -- it was the least expensive approach for their circumstances, I would recommend it.

MR. HARRINGTON: Would you do so in order to comply with this regulation in confidence that it would achieve compliance?

DR. STAUDT: Again, that depends upon their circumstances as I -- with the Meredosia units, they would -- they would -- the four small Meredosia units, I would say those guys, they're good candidates for the TTBS, okay, but there are other people who I feel are -- are likely to be based upon the information I have I believe are

likely to be in very good shape if they use halogenated activated carbon.

HEARING OFFICER TIPSORD: Question No. 58.

DR. STAUDT: 58, "With reference to page 153 of the technical support document, could provide/explain the data and source used for the five year coal use?" The -- the data I think we talked about the coal use data early on. That's where I got the data from the Illinois EPA. "Was the coal used projected to a future date? If so, what was the projected year and what were the assumption used in the projection methodology?" I assume that future use would reflect the average of the three highest of the past five years. So basically I went back to the last five years, took the three highest values, took the average and that's what I projected for future use.

HEARING OFFICER TIPSORD: C.

DR. STAUDT: C, "Was the data in Table 8.5 used to estimate the mercury in coal in Table 8.6? If so, our computations yield 170,352 ounces. If different data was used, what was the

heat and mercury content of coal used?" I calculated it using that information but based upon the PPM of milligrams per kilogram and the tons used, so you might get a slightly different number if you calculated using heating value, so, you know, I got about 168,000 the other way. You got about 170,000 and they're relatively close. And the difference in whether you use the data there for the heating value method or using PPM that might explain the difference.

HEARING OFFICER TIPSORD: Question No. 59.

DR. STAUDT: All right. 59, "With reference to page 156 of the technical support document, by unit, what are coal types (bituminous, subbituminous) you're assuming Illinois units will be burning in 2009? By unit, what are the 2009/10 control configuration (SO2 NOx and PM controls) you are assuming? What is the level of co-benefits are you assuming for the 2009/10 control configurations (in pounds) and the removal efficiencies of these control configurations? D, Are you assuming that all units, except Waukegan 7 and Will County 3, can

achieve 90 percent Mercury removal through ACI? And, E, In the analysis of CAMR 2010, did you employ the Phase 1 CAMR unit allocations and allow for system-wide trading? Also, are you assuming the most cost-effective method of compliance under CAMR in 2010 is to install control technologies on all but six of Illinois coal unit?" All right. 59A, B, and C all involve data. I'm not sure how you want to do this so I'll leave it up to the Board if you want to go down unit by unit and provide this information or if it's better to produce a table or something like that. It's up to you folks.

HEARING OFFICER TIPSORD: It's up to Mr. Harrington.

MR. HARRINGTON: I think a table would probably be easiest for everyone in this if that's acceptable.

DR. STAUDT: I can produce a table, not this very minute, but I will get it to you. So that's A, B and C. D, "Are you assuming that all units except Waukegan 7 and Will County 3 can achieve 90 percent mercury removal through ACI?" I'm assuming that they all can comply that this

is -- this is the -- this table is really the way of estimating costs. And my assumption is this is what it will cost and many of them may get the 90 percent removal and the -- but they will comply using at those -- at those costs and that may be 90 percent mercury removal through ACI or in other cases there are others that may be using in co-benefit removal. As I mentioned earlier, the only unit -- the units that I do have, I'm not sure if they will able to make 90 percent are the four small Meredosia units which are high sulfur and -- and also assuming if Hutsonville continues to burn high sulfur coal, they may not be able to achieve 90 percent in the manner that's assumed in the TSD.

HEARING OFFICER TIPSORD: Excuse me. We have a follow-up.

MS. RAHILL: Katie Rahill for Kincaid. When you were coming up with these costs in Table 8.7, did you consider TTBS in the cost --

DR. STAUDT: Any cost -- any cost associated with the TTBS, is that what you're saying?

MS. RAHILL: Well, right. The

question that you were just responding to was whether or not all the units could comply with 90 percent given the cost?

DR. STAUDT: It's my, you know, except -- except for the four Meredosia units and the Hutsonville, when I put this together, I was -- when I put it together, I was originally expecting Meredosia and Hutsonville to be able to possibly meet 90 percent. Since, of course, and we're going to get into all the discussions I'm sure about revisions to my testimony, so we can go into that later. But it was my expectation that -- that other -- it was my expectation that people would be able to comply in the manner shown. Now whether that was 90 percent or -- or -- or the emissions based the -- output based standard or somebody is getting 89 percent or somebody else has higher -- is over 90 percent and averaging, that was my -- I did assume that. I didn't -- at the time I put the TSD together, there was not a temporary technology based standard so there wasn't any -- I wouldn't factor the cost in anyhow.

HEARING OFFICER TIPSORD: And then E

was the analysis.

DR. STAUDT: In the -- Yeah. Okay. No, I did not, although, CAMR allows trading. I'm assuming that the allowances will probably reflect a price close to what it costs to control a PRB unit with halogenated sorbent or higher, and we're going to have more -- we do have more questions on this. My personal view and that of most others including EPA allowances at for --

HEARING OFFICER TIPSORD: You have to slow down especially when you're reading.

DR. STAUDT: Oh. My personal view of allowances prices, at least initially, and the EPA apparently shares my view will be much more expensive than the cost that I estimate for controlling PRB fired units with halogenated carbon. So as a result I don't -- I don't expect that there's going to be a lot of savings through buying allowances, and we're going to talk about this in the morning so -- 60 -- 68, "With reference to page 157 of the technical support document, What is the basis of your statement ".....it is reasonable to say that the cost of allowances should be somewhat higher than the

cost and the market for producing allowances."

Well, the basis of that statement is that the cost of allowances should be greater than the cost of -- the cost to produce the allowances from the least expensive marginal units to control, otherwise, there would be no incentive to produce the allowances or sell them. According to DOE's information and the information from other sources, units burning western coal are among the least expensive units to reduce mercury from using sorbent injection.

Okay. "Are not allowance prices based upon the marginal cost of control, not incremental cost of control as displayed in Table 8.19?" Allowance prices are sold at a price that the market will bear. Experience has shown that the market price of allowances tends to be at least as expensive and often more expensive than the typical cost of control. For example, in 1999 the OTC NOx allowances started trading at about $3,000 a ton and reached a peak of $7,600 a ton although the cost to produce these reductions were low NOx burners were widely believed to be in the range of a few hundred dollars.

Similarly, the 2003 Sip, S-I-P, call NOx allowances were $5,000 per ton for several months and peaked at $8,000 per ton, although the cost to create these allowances with SCR was generally viewed to be much less.

HEARING OFFICER TIPSORD: Could I make a point of clarification? The question refers to allowances based on -- based upon the marginal cost, not incremental cost as displayed in Table 8.19, I believe that's Figure 8.19 on page 159.

DR. STAUDT: 61.

HEARING OFFICER TIPSORD: Yes. Ms. Bassi?

MS. BASSI: If allowances cost more than it would -- than control, why would people pay those prices?

DR. STAUDT: Well, it's -- well, it's a good question. First of all, there are people who have a bad -- a misunderstanding of what those prices should be. In other cases people get in a bind and need to buy the allowances and their choice can be, well, we either buy the allowances or we don't run. And so all of a sudden the value of those allowances goes up --

goes up quickly. There are a lot of reasons why people -- people pay -- spend over the cost, but by and large it's smarter if -- if you're doing your -- if you're calculating what it's going to cost to use a control, it's a good idea to put in controls.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: What creates the allowances that could be sold?

DR. STAUDT: Those -- Basically those are -- what creates the allowances are reduction in emissions and those -- those don't come out of thin air. Someone has to generate those allowances.

MS. BASSI: Does that mean then that someone has over control?

DR. STAUDT: Well, you have to define what you mean by over control?

MS. BASSI: Has someone controlled to a point that they -- that they have been allotted more allowances than they must surrender in order to be in compliance?

DR. STAUDT: Well, the allowances -- the allowance -- someone who controls to a point

where they have more -- they have more allowances than they need to use can choose to either, depending upon the particular scenario, they may be able to bank them or they may be able to sell them, but that's where the allowances come from, yes.

MS. BASSI: Thank you.

HEARING OFFICER TIPSORD: Mr. Zabel?

MR. ZABEL: With that said, do you have any training as an economist?

DR. STAUDT: Yes. I have a -- hold Charter Financial Analyst designation.

MR. ZABEL: It wasn't listed in your estimate. Where did you obtain that?

DR. STAUDT: It's administered by the CFA Institute and it's a three year program that many portfolio managers have at places like Fidelity and Goldmans (phonetic).

MR. ZABEL: Which gives it investments.

DR. STAUDT: Yes, investments and economics.

MR. ZABEL: And in answering question 6, it appears you were reading from something in

part; is that correct?

DR. STAUDT: Excuse me?

MR. ZABEL: It appeared when you were answering Question No. 6 --

DR. STAUDT: These are my notes.

MR. ZABEL: Okay. Did you have help in preparing those notes?

DR. STAUDT: No.

MR. ZABEL: Now let me ask you: Is there factors that would go into the cost of an allowance other than the cost of control?

DR. STAUDT: The cost -- the price for allowances are base -- Do you want the cost or the price per allowance?

MR. ZABEL: Price.

DR. STAUDT: The price of allowances are based upon what the market is willing to pay.

MR. ZABEL: And what determines that price?

DR. STAUDT: What -- what -- what buyers and sellers are willing to agree on.

MR. ZABEL: And one of the things that would be whether they could obtain the allowances by putting it in control, would it not?

DR. STAUDT: That would be a factor.

MR. ZABEL: But there's a stickiness to that, is there not, a timing problem?

DR. STAUDT: If you could elaborate what you mean by timing problem.

MR. ZABEL: If I need the allowances today, it's probably pretty hard to build a scrubber on an SCR today?

DR. STAUDT: That's correct.

MR. ZABEL: That's a factor that goes into the market for allowances, does it not?

DR. STAUDT: Yes, it is.

MR. ZABEL: And that price, that availability of allowances are -- gives the source, does it not, the flexibility to decide if or when to build the control?

DR. STAUDT: Well, how a company those -- the ability to participate in allowance market does give them some level of flexibility, that's correct.

DR. ZABEL: Thank you.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: Do I understand you'd

be saying that in the context of the mercury role and CAMR role, that it is less expensive to people who put their controls in and to buy allowances?

DR. STAUDT: It's my expectation that allowance prices will be high enough so that utilities in Illinois, many of them will likely install sorbent injection anyhow. I don't think they're going to be -- I don't think they're going to be available at a low cost.

MR. HARRINGTON: So obviously the implication of what you said is that under the Federal CAMR rule people will have incentive to put in these controls regardless of whether the Illinois rule is adopted?

DR. STAUDT: The -- Essentially you would only be required -- Basically all somebody would do is control up to a certain point under CAMR. They may install these controls. They may or may not use them. They -- they would not use them to the extent -- I don't expect that they would use them to the extent that they will be required under the Illinois rule to get the kind of reductions in mercury emissions that the

Illinois rule would provide.

MR. HARRINGTON: You would expect them to install controls on all or most facilities to some level?

DR. STAUDT: Well, let me -- I think that there are many units that would. There are some units that wouldn't. What a company specifically does is up to them. In looking at these cost estimates, I came up with what -- what the cost would be for under a certain cost to comply with the Illinois rule under a certain scenario. Frankly, there are possibilities that might actually cost less to -- cost less than what I predict based upon someone may have more co-benefit removal than I anticipated or someone may, unbeknownst to me, may decide to install a scrubber and then get more co-benefit removal.

As far as CAMR is concerned, Illinois -- Illinois units, the PRB units, are uniquely inexpensive to control relative to certain bituminous units with the halogenated sorbent, so that in a sense that's the -- sets the marginal -- that's -- those -- that sets the margin, so you know those are the marginal sources -- the

marginal sources, the price on the market has to exceed the cost to produce them.

HEARING OFFICER TIPSORD: Ms. Bassi?

MS. BASSI: Did I understand you to say that the PRB units are uniquely inexpensive to control with ACI?

DR. STAUDT: They are inexpensive to control with ACI.

MS. BASSI: Okay. And following along with the train of thought, if the cost of control is less than the cost of an allowance or allowances, would there not be an incentive then for Illinois units to control in excess of what's necessary for them to comply with an allotment?

DR. STAUDT: Perhaps.

MS. BASSI: So that they can sell their allowance?

DR. STAUDT: Perhaps they could.

MS. BASSI: To those eastern companies that have all that bituminous coal?

DR. STAUDT: You know, you're -- you're hypothesizing -- you're looking, you know, creating a hypothetical scenario and, you know, all I can say is perhaps but perhaps not.

Companies are going to make their own decisions.

MS. BASSI: Of course.

DR. STAUDT: You know, apparently the companies here, they may not -- the opinions expressed here that it's not that inexpensive, I think. They may not agree with me, but it's my opinion that it is inexpensive so they may choose a different path.

MS. BASSI: That's true. I was asking if this scenario is a perhaps and I think you said it is?

DR. STAUDT: Yes.

MS. BASSI: Thank you.

CHAIRMAN GIRARD: I have a question, Dr. Staudt, listening to what you're saying, would there then be a financial incentive for the rest of the Illinois power plants that use bituminous coal to make a switch to the PRB subbituminous coal?

DR. STAUDT: Well, it's not as simple as that because people also have to comply with the Clean Air Interstate rule and some people may choose to install scrubbers and SCR. And if you do that, then -- the mercury in my opinion, the

cost of mercury controls are a drop in the bucket compared to NOx and SO2. And I think people -- people's decisions on -- on mercury will probably fall out of what they do regarding NOx and SO2 because they may decide to put in scrubbers and SCR and then, you know, and if once they do that, they may choose to switch to bituminous coal. There are a lot of factors. People can behave in different ways. And when I made my estimate, you know, not being able to predict all the -- all the things that these, you know, these power plants and power companies have a lot to consider in terms of how they operate their plant. Basically I assume that a certain configuration or the configuration basically wouldn't change, but perhaps they will, perhaps they will add scrubbers to some of these that I didn't anticipate.

CHAIRMAN GIRARD: Thank you.

HEARING OFFICER TIPSORD: Question -- Ms. Bugel?

MS. BUGEL: Dr. Staudt, do you know which units in Illinois are burning bituminous coal?

DR. STAUDT: Well, yes. Yeah, I have an understanding of which ones burn bituminous.

MS. BUGEL: And the -- which ones already have control configurations that will bring them close to the 90 percent or even in excess of 90 percent?

DR. STAUDT: Well, the one -- the ones listed as co-benefit in -- I guess the table -- the Table 8.9 or 8.10. So it's my expectation that Duck Creek, Dallman, Marion -- the two Marion units through co-benefit will be able to get all or, you know, nearly all the way to compliance with the mercury rule.

MS. BUGEL: And are there other units which there are already plans in development to add control systems that would also provide co-benefit?

DR. STAUDT: Yes. It's my understanding that -- some of the Dynegy units are -- have consent -- my understanding is some of the Dynegy units, Baldwin, Vermilion, and Havana have -- are under consent to create and install fabric filters and possibly, I don't know, perhaps SO2 controls at Baldwin. I'm not

sure.

MS. BUGEL: With those -- because of that and because of Dr. Girard's question, would there be any incentive then to switch to subbituminous coal because it's easier to control mercury?

DR. STAUDT: Well, those -- Baldwin already burns subbituminous coal.

MS. BUGEL: I wasn't trying to limit my questions to the ones that are burning bituminous coal.

DR. STAUDT: I think Vermilion is the only one that's burning bituminous, if I'm not mistaken. Let me check that.

MS. BUGEL: But my question was regarding all of the units that you previously listed that burn bituminous coal and also have --

DR. STAUDT: The ones that already -- the ones that already have co-benefit, you know, with a lot of NOx and SO2 reduction, there would be no incentive for them to go to subbituminous coal.

MS. BUGEL: And what are the remaining units that -- that burn bituminous coal don't

have NOx or SO2 controls that are bringing them close to the 90 percent and would then be -- need to put on ACI or some other control to meet the mercury rule?

DR. STAUDT: The question again.

MS. BUGEL: When -- We've already listed off a bunch of units that burn bituminous coal and where there would be co-benefits that would bring them close. What are the remaining units that bring bituminous coal that are pretty far off the mark in terms of the 90 percent rule?

DR. STAUDT: There are a couple of them, but not -- not a lot. There are, you know, most -- most -- the large majority of capacity in Illinois burns Powder River Basin coal.

MS. BUGEL: Okay. Thank you.

HEARING OFFICER TIPSORD: Mr. Zabel?

MR. ZABEL: Just to be clear, Dr. Staudt, when you said there would be no incentive for the ones currently burning bituminous coal to go to subbituminous coal, I assume you were referring to environmental regulatory incentive, not necessarily coal price?

DR. STAUDT: Yeah, based upon -- based

upon environmental.

MR. ZABEL: Just so the record is clear, the price of coal could affect that irrespective of the environmental regulation?

DR. STAUDT: Yes. If coal prices drop for PRB, there might be an incentive to switch.

HEARING OFFICER TIPSORD: Question 61.

DR. STAUDT: 61, "With reference to page 159 of the technical support document, what is the basis for the statement "...the 2018 CAMR limit is roughly equal to the requirements with the proposed rule, incremental cost will be negligible for 2018 compliance." Well, the 2018 CAMR limit is equal to about 20 thousand ounces, it's -- which is close to the 10 percent estimated 170,000 ounces in Illinois coal. Of course, that 170,000 ounces doesn't include any allowances for growth or -- or new capacity. So if you provide for new generation and growth, CAMR will actually require over 90 percent removal or alternatively purchase of a similar number of allowances. And again, as I go back, I -- allowances by and large, they don't come for free, and frequently they're not even cheap and

the -- the units in Illinois, I think, are in a good position to control mercury inexpensively and at a cost that's below what I expect the allowance prices to be at.

HEARING OFFICER TIPSORD: Dr. Staudt, I may have misunderstood, and heaven knows it's late I'm misunderstanding a lot anyway, you say the 2018 CAMR limit is how much?

DR. STAUDT: About -- It's about 20,000 -- the allocation from EPA is about 20,000 ounces.

HEARING OFFICER TIPSORD: And that's relatively close to the 170?

DR. STAUDT: No. It's relatively close to 10 percent --

HEARING OFFICER TIPSORD: Okay.

DR. STAUDT: -- of the 170,000.

HEARING OFFICER TIPSORD: Thank you.

DR. STAUDT: Thank you for helping me clarify that.

HEARING OFFICER TIPSORD: I didn't think my math was that bad, but it's late.

DR. STAUDT: 61(b), Is it not true that both rules are entirely different from the

points of measurement of emissions to required reduction levels, as well as, CAMR is market based cap -- There's a lot of questions here. The points of measurement of emissions as far as I know the Illinois rule uses -- uses the same CAMR measurement requirement, measurement methods so I don't know about that. As well -- The required reduction levels that would be true. There are different reduction -- the reduction requirements are different than the Illinois rule. CAMR is market based. CAMR is market based. The Illinois rule -- the question says the Illinois rule is commanded and control. I would, you know, I don't know what you mean by command and control, but it's more of a -- basically it sets -- it sets emission limitations. It's more of a specific emissions limitation requirement. So I would agree with most of that assuming that you meant by command and control being -- having emissions requirements, specific emissions requirements. But I wouldn't agree with the measurement of emissions because my understanding is that both rules have the same measurement -- be the same

emission measurement method.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: What the question was referring to obviously is the 90 percent requirement for measuring mercury in coal to the mercury emitted from power plants, particular measurement for the method for the 90 percent, where CAMR has -- just sets emission limit by plant by allowance?

DR. STAUDT: Well, you know, I think maybe if you want to go against the details what the differences are with the rules, maybe somebody from the Agency can speak to the details on how the rules differ.

MR. ROMAINE: Your comment is correct, that sources that elect to comply by means of control efficiency or input base limit would also have to determine the uncontrolled emission, the amount of mercury going into a unit. If the source elects to comply with the Alpha-based standard, the monitoring requirements would be identical. CAMR requires similar monitoring of emissions. In that regard CAMR requires

monitoring of people that both under comply and over comply and certainly addresses the same range of control performance for mercury control measures as is being addressed in the proposed rule.

MR. HARRINGTON: I think the overall burden of the question is intended to ask whether, in fact, the two rules are sufficiently different in the comparison you drew on page 159 of the technical support document really does not holdup.

DR. STAUDT: I assume that's a statement?

MR. HARRINGTON: That's a statement. But my point is do you agree with that statement?

DR. STAUDT: No, I don't.

HEARING OFFICER TIPSORD: Question No. 62.

DR. STAUDT: 62, With reference to page 195 of the technical support document, A, has Illinois prepared a projection of -- Illinois has prepared a projection of mercury emissions from coal-fired EGUs for CAMR from 2010 to 2020. Could you provide the unit specific data -- has

Illinois -- excuse me.

MR. HARRINGTON: You inverted has Illinois prepared a projection.

DR. STAUDT: Oh, has Illinois projected --

MR. MATOESIAN: It's a typo?

MR. HARRINGTON: It's a typo. "Has Illinois prepared a projection of mercury emissions from coal-fired EGUs for CAMR from 2010 to 2020?"

DR. STAUDT: Aside from what's in the TSD, I don't know -- I don't know if the Agency has done anything different.

HEARING OFFICER TIPSORD: Mr. Ross, can you answer that question? They've pointed their fingers at you.

MR. ROSS: Jim Ross. I think we did address this question earlier. It's discussed in Section 10 of the technical support document where, yes, we did project an emissions reduction that occurred as a result of Illinois rule up to 2018, and they are in the area, I think, in between 700 and 900 pounds of mercury per year.

MR. HARRINGTON: Did you prepare a

similar projection for CAMR?

MR. ROSS: Well, the CAMR has capped. I think the caps are 1.5 something tons per year and, of course, CAMR being a cap-and-trade program -- CAMR being a cap-and-trade program, those reductions aren't guaranteed since you can bank or purchase allowances. So under Illinois programs, the emissions are guaranteed to occur in Illinois and at every power plant under a cap-and-trade program, they are not. This is something we discussed in detail. Hot spots, local impacts.

HEARING OFFICER TIPSORD: I would point out, and I apologize for interrupting, there's a Figure 10.1 on page 196 of the TSD that shows the current projected mercury emissions for coal-fired power plants and has CAMR budget draft on that. Ms. Tickner?

MS. TICKNER: Just one follow-up. I guess does that include the proposed plans that are already permitted in that schedule?

MR. ROSS: If you could clarify the --

MS. TICKNER: You're showing mercury emissions out into the future. I'm asking are

you --

MR. ROSS: No. That's only for the existing EGUs in Illinois.

MS. TICKNER: Is it your assumption that the caps will still be in place, Illinois will still have a fixed amount of tons of mercury that can be emitted in a year regardless of whether they're trained or not?

MR. ROSS: Not under the Illinois rule. In fact, those emissions could increase as generation increases in Illinois.

MS. TICKNER: So you think that EPA -- USEPA is going to allow the state to emit more than the amounts that have been allocated?

MR. ROSS: Absolutely not. And we're discussing that issue with Illinois EPA. However, we believe the difference in emissions is significant in particular up to 2018. If you can refer to the Figure 10.1, you will see the gap in emissions. It's above 3,000 pounds per year all the way up to 2018, where Illinois' rule would take the level of emission down below 1,000, so there's a significant margin there.

MR. MATOESIAN: I believe you meant we

are referring to the USEPA?

MR. ROSS: Yeah.

MS. TICKNER: So I guess your assessment is that any future growth can fit under that cap?

MR. ROSS: That's our position, yes, but we are discussing that with EPA but, yeah, the margin there is substantial. And again, that is a cap and those reductions under a cap-and-trade program don't necessarily need to occur. You can bank or purchase allowances and, therefore, not reduce emissions.

MR. AYRES: This relates to something --

HEARING OFFICER TIPSORD: Excuse me. You need to identify yourself.

MR. AYRES: Richard Ayres.

HEARING OFFICER TIPSORD: And I remind you your under oath.

MR. AYRES: I am indeed. This relates to part of my testimony yesterday of what's shown here, I think, is the cap level in 2018 for CAMR. As you recall, I said EPA itself projected that the national level -- the -- the actual reduction

by 2020 would be about 50 percent from current levels and that, of course, is because of banking, so I think this -- this chart actually suggests that emissions will be much lower in 2018 in Illinois than can reasonably be expected under the CAMR kind of program.

HEARING OFFICER TIPSORD: Mr. Harrington?

MR. HARRINGTON: I'm just trying to follow-up. Am I correct IEPA did not perform a modeling allocation of the Illinois CAMR cap to the various Illinois facilities?

MR. ROSS: Not to my knowledge. We did not perform that exercise, no.

MR. HARRINGTON: Thank you.

HEARING OFFICER TIPSORD: I think that answers the rest of your answer 62.

MR. HARRINGTON: I think it does.

HEARING OFFICER TIPSORD: 63.

DR. STAUDT: "Please describe your familiarity with techniques for sampling of coal and deriving a statistically reliable sample for daily mercury content in coal-fired boiler?" My expertise is control technology, not measurement

sampling methods so I really -- I think we've talked about measurement and sampling before, and I think I made that same point.

HEARING OFFICER TIPSORD: 64.

DR. STAUDT: 64.

MR. HARRINGTON: I think that -- I think his answer basically covers up through 68 unless somebody else has a follow-up. He's not familiar with that.

HEARING OFFICER TIPSORD: Wonderful. 68.

DR. STAUDT: 68.

MR. HARRINGTON: 69.

DR. STAUDT: "Earlier I asked about your familiarity with the design, construction and installation of pollution control equipment. Please describe the variables you expect to deal with in installing halogenated powder activated carbon at the Illinois facilities." The variables associated with sorbent injection systems are largely associated with the injection system. Most of the other equipment is skid mounted. The gas flow rate and level of control will determine the feed rate and thus the size of

the storage silo and the sorbent conveying equipment. With regard to the injection system, it would normally be -- it would be normally -- and I would recommend a flow -- computation of flow model to ensure that you have good distribution that would be used to determine the best -- best approach for injection.

HEARING OFFICER TIPSORD: 70.

DR. STAUDT: "In your estimates of cost, does that include the design and installation of the technology or only purchase?" The estimates are intended to be all inconclusive, but as I mentioned these -- the biggest costs of a sorbent injection system, of running sorbent injection system, is the sorbent. The equipment even -- even -- I know some people will disagree with the estimates that were used, but even if I'm off by a factor of two in the total economics, it doesn't really make a difference. It's really the sorbent that drives the cost.

HEARING OFFICER TIPSORD: 71.

DR. STAUDT: 71, "Would you be surprised if those numbers were twice what you

estimated, just for the installation of the sorbent injection system?" Perhaps. If people have done estimates and I haven't -- that I haven't looked at, I'm not going to criticize them. But as I said before, even if you double the cost from what I estimated, the economics doesn't change significantly.

MR. HARRINGTON: I think 72 and 73 have been answered.

DR. STAUDT: 74, "Assuming that the Sorbent Technologies were not sufficient to achieve a 90 percent reduction, would you agree that the TOXECON array of sorbent injection followed by a baghouse is the most logical way to achieve those reductions based upon present knowledge and information? If not, please describe what the alternatives would be, how much they would cost, and how long they would take to install."

Okay. First, there is an output base limit that can be used and there's also averaging that can help to a degree. So if you can't achieve 90 percent, there are -- there are other ways to address -- address compliance with the

emission standards. If -- But to address your hypothetical question, if compliance with the emission requirements is a rule were not possible through injection upstream of an ESP, although I believe it is, TOXECON is one option.

Other options include methods to enhance co-benefit removal and reduce the amount of mercury reduction that is necessary from the sorbents. These things there are -- I'm going to list a couple of things that may or may not be, you know, applicable at any particular site but there are things like coal blending, switching combustion controls. People have found that actually stage combustion actually helps. Another is the use of chemical additives that have been shown to further improve the performance of sorbent such as those used in Alstom's mercury technology. In the -- that -- that Exhibit 52, on the last page of Exhibit 52 there is a -- there is a chart -- there is -- is a chart that shows the kind of -- the kind of improved removals that they have been able to achieve using the mercury, and they have different types of chemicals called MercClean

(phonetic) 4, 5, 6. These are all proprietary approaches, and you can see they can get even better removal efficiency and the cost will vary by facility but will be far less than the cost of a TOXECON, although somebody might eventually choose a TOXECON.

You know, another is Min Plus, which is technology that showed high removals at a Richmond, Indiana, power plant. The injection system cost is about $35 a kilowatt because it also includes a below NOx combustion retrofit. So I understand sorbent cost for Min Plus is on the same range of the carbon sorbent and that the ROFA, R-O-F-A, system, it comes with a Min Plus injection also reduces NOx.

In addition, I understand that other companies are developing and testing mineral based sorbents and they're testing them even here in Illinois that may offer advantages to halogenated carbon sorbents. So the bottom line is there are many approaches that might be used to achieve 90 percent or the output based limit without halogenated carbon or in addition to halogenated carbon that are not costly as TOXECON

so --

HEARING OFFICER TIPSORD: Follow-up.

MR. HARRINGTON: Can I have a moment, please?

HEARING OFFICER TIPSORD: Sure. While Mr. Harrington is taking that moment, I want to note for the record that we have reserved questions to Ameren, the general questions 41, 42, and 43, and indicated that Mr. Porter would be answering those questions. I talked to Mr. Kim at a break, and I think it's probably more appropriate for Dr. Staudt and Mr. Ross to address. I don't want them to get lost in the record. They will be answered, but we felt that they be more directed to the IEPA than the technology. Mr. Harrington, did you have any follow-up on question 75?

MR. HARRINGTON: No.

HEARING OFFICER TIPSORD: You may certainly go back, but the hour of seven o'clock has arrived and I thank you all for your patience. I thank you all, even though there are donuts left, we're going home tonight. I'll see you all tomorrow at 9 a.m.

(Hearing recessed at 7 p.m.)

STATE OF ILLINOIS

COUNTY OF FAYETTE

C E R T I F I C A T E

I, BEVERLY S. HOPKINS, a Notary Public in and for the County of Fayette, State of Illinois, DO HEREBY CERTIFY that the foregoing 242 pages comprise a true, complete and correct transcript of the proceedings held on June 21st, 2006, at the Illinois Pollution Control Board, 1021 North Grand Avenue East, Springfield, Illinois, in proceedings held before Hearing Officer Marie E. Tipsord, and recorded in machine shorthand by me.

IN WITNESS WHEREOF I have hereunto set my hand and affixed by Notarial Seal this 25th day of June, 2006.

_____

Beverly S. Hopkins, CSR, RPR
Notary Public, Fayette County
CSR License No. 084-004316