BEFORE THE BOARD OF ENVIRONMENTAL REVIEW
OF THE STATE OF MONTANA

IN THE MATTER OF:	)CASE BER 2007-07-AQ
SOUTHERN MONTANA ELECTRIC	)
GENERATION AND TRANSMISSION	)
COOPERATIVE - HIGHWOOD	)
GENERATING STATION	)
AIR QUALITY PERMIT NO. 3423-00	)

TRANSCRIPT OF PROCEEDINGS - VOLUME I

Heard at Room 111 of the Metcalf Building
1520 East Sixth Avenue
Helena, Montana
January 22, 2008
10:40 a.m.

BEFORE CHAIRMAN JOSEPH RUSSELL;
BOARD MEMBERS LARRY MIRES, HEIDI KAISER, GAYLE SKUNKCAP, BILL ROSSBACH, ROBIN SHROPSHIRE, and DON MARBLE

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I N D E X

E X H I B I T S

Whereupon, the following proceedings were had and testimony taken, to-wit:

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CHAIRMAN RUSSELL: We're going to get started. We'll just take this up. And we are now hearing the MEIC case on Highwood Generating facility.

Before we get started, we've spent -- Katherine and myself and other Board members, with input through me -- have discussed the length of the case, and I look right at the end of this document that was submitted, and all of the parties consider this might take up to two and a half days. That will probably not be acceptable, as we will be done Wednesday evening. So if we have to go late tonight and hard tomorrow, then that's what we'll do. But we have other commitments, and we'll have to be done at that point.

When we leave here tomorrow, we expect to at least give Katherine a good idea of how we're going to move forward with the potential of deliberating this in person or on a telephonic conference, but all that will be determined as we move forward in this case.

Katherine has a few statements to make, and I'll just kind of front end load that there was summary judgment granted on one part of this. We are here for a specific reason for next two days, and please stick to that. Katherine.

MS. ORR: Mr. Chairman, members of the Board, I wanted to provide a little bit of a road map for the Board members. I don't know if there are some Board members here who have not been in a contested case before, and so that's one of the reasons why I am going to proceed to do that. And the other is: The parties and I had a prehearing conference last week, and we discussed sort of the working rules of this hearing last week, and I thought I would go over those. And this will not take long either.

You'll see that the order of presentation is that MEIC will go first, and then the Department, and then SME. And they have told me that they have up to, I believe, two witnesses; some just one. So the evidence will go in through the witnesses, or through the stipulated exhibits that you have, and those exhibits are available electronically and in hard copy. The contested exhibits will be presented to the Board as they

come up, and then there will be conceivably an objection to that exhibit, and then a response to that objection, and then I will recommend a disposition of that objection, and the Board will decide what to do.

In the interest of time, I discussed with the parties the fact that we would like the objections in general to be held to a minimum. There are sort of two categories of objections, the objections under the Rules of Evidence; but also if it looks like the proceeding is duplicative, or not something that should be covered in the scope of this hearing, the Chairman will speak up, and will address that.

Another matter is that the parties will be introducing testimony through their expert witnesses, and you all know, Board members, that there has been a dispute about what those experts can say, and there very well may be objections addressed by the parties as to the propriety of that testimony. Again, I think the best approach to that will be that there will be the expert introduced, placed under oath by the Court Reporter, and then there may be an objection to what testimony ensues, and argument, and then I

will make a suggestion about it to the Board, and then the Board can decide what they want to do.

There will be an opening and closing statement, and the parties have been allotted fifteen minutes each, each for opening and each for closing. And this is the opportunity for the Board to hear an overview of all of the issues, and I find those to be very useful.

You all have in front of you a prehearing memorandum, and I also think that these are very useful for a decision maker. The parties have arrived at a stipulated set of facts that don't have to be addressed in this hearing, and then the parties have put down in writing what it is that they diverge on; and you have had a chance to review that very quickly, and that is intended, this prehearing memorandum is intended to be the focus of this hearing.

And the deliberative process at the end of this will be that there will be some fifteen -- whatever the number is -- issues for the Board to make a decision about -- maybe it will be many fewer than that -- and the Board will vote on that ideally tomorrow; and then I will write that up, and circulate the draft, and then the Board will

have a chance to vote on that at either a telephonic meeting or a meeting in person. So that is the suggested process for the deliberations.

If I could be so bold as to help the Board think about these issues. They really can be distilled down into, in my view, four issues: One is whether PM10 can be used as surrogate for PM2.5; what are the technologies available out there for control of PM2.5 and PM10 emissions; what are the reliable testing methods that are available to analyze the effectiveness of those control technologies; and what are the appropriate emission levels for PM2.5, the control of PM2.5.

And some of the things that you will hear today will address what other plants are doing in the country, what other permits say, what the EPA guidance is, and what the experts say. So if that helps you -- and I hope it does. So we can get started. And at this point, we will hear an opening statement from MEIC and CCE, and there might be some other housekeeping matters. We do have to admit the stipulated exhibits, and we might as well do that right now.

CHAIRMAN RUSSELL: All right. I guess

we'll do this through board action.

MS. ORR: Okay.

CHAIRMAN RUSSELL: Do I have a motion to admit the stipulated exhibits?

MR. ROSSBACH: Sure.

CHAIRMAN RUSSELL: It's been moved by Bill. Is there a second?

MR. MARBLE: Second.

CHAIRMAN RUSSELL: It's been seconded by Don. Discussion.

(No response)

CHAIRMAN RUSSELL: Seeing none, all those in favor, signify by saying aye.

(Response)

CHAIRMAN RUSSELL: Opposed.

(No response)

MS. ORR: For clarification, those are the exhibits that are listed on the Second Revised Joint Stipulated Exhibit List, and everyone should have a hard copy of that as well as an electronic version. Are there any housekeeping matters? It looks like there might be.

MR. REICH: If I might. Mr. Chair, members of the Board, Kenneth Reich, Wolf Block, representing Southern Montana. I just had a

couple of issues in no particular order.

As to the exhibits themselves, it should be noted that when we put together the joint stipulated exhibits, we tried to err on the side of inclusiveness. There are a few exhibits that Southern Montana had some questions about the relevance of. We may raise those during the hearing, but I understand that they've been admitted.

With respect to the joint memorandum that's been submitted, I just wanted to make it clear that it's only the agreed facts that have been agreed to. The parties have their own contentions on the factual issues and legal issues that have not been agreed to, and those are set out separately, so the Board knows that neither party is agreeing to everything that's in the joint memo.

Thirdly, the Chairman mentioned the time frame, and we were alerted by Ms. Orr last week as to the two day time frame. We've all met and talked to try to endeavor to meet that. I just have to say on behalf of Southern Montana, since we're the third party to be presenting, and really there is no time limits on anybody's presentation,

I have to reserve the right to object if the Commission cuts off the hearing at a point when we have not completed our case. So I need to reserve that objection, Mr. Chair. But I certainly understand your constraints, and we'll do our best to meet them.

And fourth, just a housekeeping measure. I believe it was either the end of last week or over weekend that we submitted in electronic form an affidavit of Tim Gregori, the General Manager of Southern Montana Electric with respect to the CO2 capture and control efforts of Southern Montana that the Board was interested in hearing. That affidavit has been submitted, it's been signed. We had hoped to have it notarized today. We'll try to do that. But it's been submitted in a signed form.

And Mr. Gregori has indicated a willingness and an ability to come back before the Board in several weeks, if the Board intends to have a hearing, and at that point, he'd be happy to answer any questions.

Those are my only preliminary matters. Thank you.

CHAIRMAN RUSSELL: Thank you.

MS. DILLEN: For the record, my name is Abigail Dillen. I'm here on behalf of the Petitioners, Montana Environmental Information Center and Citizens for Clean Energy.

This is a case about enforcing requirements that have existed for the last ten years. A couple weeks ago, you had before you a novel issue, one that hadn't been decided by any other court of law, regarding CO2 and whether that is a pollutant that is subject to regulation. Before we begin today's proceedings, I just want to differentiate this case.

There is no dispute that PM2.5, a very fine particulate matter, is a regulated pollutant under the Clean Air Act, and that it's subject to BACT requirements. That's not disputed by any of the parties. The questions that we're addressing today are: Can the Montana DEQ and permittees like SME omit to look at PM2.5 specifically, and just rely solely on an analysis of PM10? These are larger particles that are less dangerous than the very finest PM2.5 particles.

The law gives very clear guidance under both the Clean Air Act of Montana and the Federal Clean Air Act. The definition of BACT is the

maximum degree of reduction of each pollutant subject to regulation under this act, that being the Clean Air Act. Two important concepts there: Each pollutant, and the maximum reduction. That's what needs to happen.

Ten years ago, EPA decided that regulating PM10 was not enough to protect public health, that these smaller particles, these PM2.5 particles, that often we can't even see, but that we breathe in, they lodge in our lungs, they create asthma, they create heart attacks, even premature death; and the people who are most vulnerable are children, and older people, and those of us who have pre-existing conditions, heart conditions and respiratory conditions.

In 1997, EPA decided we need primary health based National Ambient Air Quality Standards for PM2.5 to address those health threats, and in the past ten years since those NAAQS were issued, over 100 new studies have told us that we underestimated then how dangerous PM2.5 is; and for that reason, EPA in 2006 has made the National Ambient Air Quality Standards twice as stringent for PM2.5 as they once were. That's the back drop for this case, and that's why this is

such an important issue, and one that I thank you so much for spending the time today and tomorrow to hear.

What we have in paper is all of these health studies and a new revised standard, but what we're doing on the ground is looking only at PM10, these particles that we determined ten years ago were so much less dangerous. What this means as a practical matter is when new facilities want to construct new facilities like the Highwood Generating Station -- that may be around for the next fifty years or more -- we're not asking them to do the very best to reduce their emissions of PM2.5. We're looking strictly at PM10. That's exactly what happened in this permitting process.

What Petitioners are asking you today is if we can continue to do that legally in compliance with what the Montana Clean Air Act and the Federal Clean Air Act require. You're going to hear today from SME that it's okay to keep ignoring PM2.5, because EPA has given Montana a free pass. There are at least three reasons why that's wrong.

The first is: Montana has its own BACT requirements. It's implementing the PSD program

under the Federal Clean Air Act; but Montana's own permitting regime, which governs construction of new facilities and the issuance of air quality permits, requires that maximum emission reductions be achieved using BACT. So this is a requirement that the State of Montana, the BER, and the DEQ need to comply with.

Second: EPA is very helpful in a lot of ways, but it does not have the power to supersede what Congress has said and what the Montana Legislature has said. When there are plain legal requirements, EPA cannot provide guidance that says, "Don't worry about them." That's not the way the law works.

It's our contention on that basis that the issues before you are really legal issues. However, we're here for an evidentiary hearing because essentially what SME has argued in this case is: "We agreed that this is what the law is, but we think it's impossible to comply with the law."

So over the next two days, what you have to be thinking about is: Is it really impossible to do a BACT analysis for PM2.5? What you'll hear today from our expert, Mr. Hal Taylor, is that

we've had technologies available for decades that control fine particulate matter, including PM2.5. He'll tell you about what those technologies are. He'll also tell you that some of those technologies work a lot better for the very smallest PM2.5 particles than they do for the larger PM10 particles.

I suspect you'll also hear a lot about whether there are adequate test methods available to verify compliance with PM2.5 emission limits and to determine what a facility's PM2.5 emissions will be in the first instance.

Well, this is a case where a condensible emission limit has been set, and as you will hear witness testimony to this effect, condensible particulate is made up of PM2.5 emissions limits. So if we knew enough in the Highwood permitting process to estimate what the condensible emissions would be, and to what extent they would be controlled, we know enough to estimate and control PM2.5 emissions.

We heard some questions when we were here with you last month about what test methods are out there and when they became available. As you'll see in our factual contentions, EPA has

been developing tests since it first designated PM2.5 as a NAAQS pollutant in 1997. One of the these conditional test methods that EPA gives states permission to use was called Conditional Test Method 40, which was promulgated in 2002; Condition Test Method 39 -- which I think you'll hear testimony indicating that this is a very good test, has been published on EPA's website since at least 2004; and SME in a separate appeal is proposing to use of the third approach that EPA has recommended, and that's a modified approach, tinkering with test methods that have been formally promulgated, but it is not itself a finally approved method.

So when you hear about the absence of test methods that work, you're hearing that message from a permittee which is itself urging the use of some of these test methods in order to comply with its condensible emissions limit, and again I'll remind you that these condensible emissions are primarily 2.5 emissions.

You might ask, "Well, if they have already looked at some of the PM2.5 in these condensible emissions, and maybe they're capturing some other PM2.5 with their other controls, why

should we go back and look at this again?" There is a very important answer to that, which is that some is not good enough when you can do more under the Clean Air Act. The aim is not to get some fine particulate emissions, the aim and the necessity is to get the maximum achievable reduction that's possible with the technologies that we have today.

Because we have technologies that can do a better job at capturing the smallest particles than the technologies that SME is currently proposing to use, it's vital that we go back and consider those, and that we consider whether they're too expensive or not, keeping in mind how much more dangerous PM2.5 is than PM10. When we are sorting out the costs and benefits of controlling this pollutant, it's a very different analysis than it is for PM10, because it's toxic in such smaller concentrations. So getting that extra bit of control may well be worth the money.

As EPA has concluded, based on a wealth of scientific evidence, just a .5 increase in micrograms per cubic meter -- which is the measure that we use for PM2.5 concentrations -- can result in 15 to 20 additional premature deaths. This

weighs heavily on my clients, and I think it should weigh heavily on the Board's evaluation of whether we've done the very best in terms of reducing this plant's PM2.5 emissions.

And I say that in particular because we have evidence that other permitted facilities have significantly lower condensible emission rates and lower filterable particulate matter emission rates as well. We have no explanation as to why those lower emissions, those emissions reductions are not achievable at this plant. That again weighs in favor of remanding this permit, and asking SME and DEQ to take a real look, a look for the first time, at the best we can do for PM2.5.

When we look at the permit analysis that's provided by DEQ and the permit application that was provided by SME, there is a lot of talk about numbers that compare favorably to what other plants have done across the country, because they're an average. So basically they're comparing favorably to limits that were set maybe ten years ago. They're not comparable to the most recent and lowest limits, and there is no consideration whether even more emissions reductions could be achieved than have already

been achieved.

And I want to leave you with a short analysis that a Circuit Court in Kentucky recently issued in a decision that was challenging a permit for a coal fired power plant in Kentucky, and there the contention had been, "We've set limits that are comparable to limits across the country."

And what the Judge said in that case was: "The question that the agency must answer is not what have other plants achieved in the past, but rather what can this plant achieve for the future?" And he went on to say, "The answer to this question is critically important considering that the pollution control standard that the State requires today will be in effect for the fifty year life span of this plant."

The same is true here today. The emissions limits that we set for Highwood coal fired power plant will determine its PM2.5 pollution and its impacts on public health in Montana for decades to come. Let's do this right. Again, thank you for being here for this hearing today.

CHAIRMAN RUSSELL: Thank you.

MR. RUSOFF: For the record, I'm David

Rusoff. I'm a staff attorney for the Montana Department of Environmental Quality. There are a couple of things I'd like to address real briefly before I go into what I expect the evidence in this case to demonstrate to the Board over the next two days.

The first point is that with all due respect, I disagree with the last issue identified by the Board's attorney, which as I heard it and wrote it down was: "What are the appropriate emission levels to control PM10 and PM2.5?," or something close to that. And that's not an issue that's been identified by the Petitioners in this case.

In their hearing affidavit, which I'll quote from, they stated that, "As DEQ acknowledged, the emission rate established for condensible PM10 is not the lowest when compared to other BACT determined rates set across the country." The Petitioners have never suggested that any control technologies, any particular control technologies or emission limits other than those determined to constitute BACT by the Department actually constitute BACT. And their witness, Hal Taylor, specifically testified in his

deposition that he was not going to state that any particular control technology constituted BACT for the Highwood Generating Station.

And I would submit that a BACT analysis, as you'll hear over the next couple of days, in this particular case for the Highwood Generating Station, Department staff spent approximately five months reviewing that permit application, including the BACT analysis submitted by SME.

So I don't think that it's within the scope of a two day contested case hearing for the Board to essentially make a BACT determination in that short period of time and within the confines of the evidence that will be presented in a contested case hearing, compared to technical staff spending months preparing a permit application, or reviewing and verifying the information in a permit application.

I just want to make that clear that the Department doesn't believe that that is actually an issue in the case. Clearly the Petitioners have challenged the condensible particulate permit limit as not being the lowest limit found around the country, and the Department has no problem with that being an issue in the case.

The other thing I'd like to point out from Ms. Dillen's opening statement is that I couldn't agree more that the issue in this particular contested case is whether the limits that the -- is whether BACT is a case-by-case analysis of what the particular facility can consistently achieve. And the evidence in this case will show that the control technologies and emission limits that correlate to those control technologies selected by the Department are the maximum reductions for particulate emissions that the Highwood Generating Station can reasonably be expected to consistently achieve.

The Petitioners' remaining claims in this case are very narrow, as you probably have surmised from reviewing the parties' prehearing memo. There are essentially two claims. The first claim is the Petitioners' allegation that the Department unlawfully made a BACT determination for PM2.5 emissions by using a BACT determination for PM10 as a surrogate; and the second claim essentially is Petitioners' allegation that the Department unlawfully imposed a BACT determined particulate limit on the Highwood Generating Station is not the lowest

emission found in the country. And I'll address of each of those assertions separately.

First regarding the Department's use of PM10 as a surrogate for PM2.5, you'll hear in this case that although the Petitioners submitted comments to the Department on various aspects of the draft permit for the Highwood Generating Station, which included the surrogate PM10 analysis, Petitioners submitted no comments to the Department asserting in any way that there was any problem with using PM10 as a surrogate for PM2.5 in the BACT determination.

And the reason for this, as you'll hear over the next two days, in using PM10 as a surrogate in the BACT analysis by SME and in the Department's BACT determination for PM2.5, SME and the Department merely were following EPA policy and the accepted practice by permitting authorities throughout the United States.

This surrogate policy was in effect when SME prepared its permit application; it was in effect when the Department made its BACT determination; and the surrogate policy is still in effect today. You won't hear any evidence in this case that any permitting authority in the

country has made a BACT determination for PM2.5 without using a BACT determination for PM10 as a surrogate, and you also won't hear any evidence that any permitting authority in the country has set an emission limit specifically for PM2.5 for any power plant.

What you will hear is that all of the tools necessary to conduct a BACT analysis for PM2.5 specifically, and to determine compliance with a specific PM2.5 emission limit, have not been fully developed and were not available to SME and the Department. These tools include PM2.5 emission factors, which are necessary to predict PM2.5 emissions and evaluate the cost effectiveness of controlling PM2.5 emissions; and the tools that are lacking also include EPA approved referenced test methods for developing emission factors and determining compliance with any BACT determined PM2.5 limit.

Months after the Department made its decision on SME's permit application this past May, EPA confirmed just this past September that these tools still are lacking, and that it continues to be appropriate to use a BACT determination for PM10 as a surrogate for a BACT

determination for PM2.5.

The evidence in the case will show that there simply wasn't any practical or reasonable alternative available to SME and the Department to conducting a BACT analysis for PM2.5 using a BACT determination for PM10 as a surrogate.

Regarding the Petitioners' claims concerning the adequacy of the Department's BACT determination, the Petitioners claim -- that the condensible particulate permit limit in the permit is not the lowest limit compared to other rates set across the country -- appears to be based on the false premise that BACT is the lowest limit compared to other rates set across the country. However, that description applies to the control technology specifically applicable to non-attainment areas, which is the Lowest Achievable Emission Rate or L-A-E-R, referred to as LAER.

BACT is the control requirement applicable to areas that are in attainment with the ambient air quality standards, such as the area where the Highwood Generating Station would be located.

And rather than a black and white

number, such as the lowest emission rate being achieved across the country, BACT is a process, and you'll hear that there isn't any required method for conducting that process. You'll also hear that SME and the Department followed a reasonable method, and the method recommended by EPA.

The BACT is a case-by-case judgment by a permitting authority regarding the maximum reductions achievable by the particular emissions source in question, taking into account energy, and environmental impacts, and economic costs. By definition, BACT is a discretionary judgment as to the maximum reductions consistently achievable, that is, achievable at all times by the particular emitting unit.

You'll hear in this case that the Department conducted a lengthy evaluation of SME's BACT analysis over the course of approximately five months; the Department imposed the top control technologies for both filterable and condensible PM10 in a surrogate BACT determination for PM2.5; that the Department did not accept SME's proposed particulate limits; and that the Department imposed substantially more nonstringent

limits on SME than SME proposed; and that these limits are consistent with emission limits for other similar emission sources across the country.

In their comments to the Department on the draft permit for the Highwood Generating Station, Petitioners also submitted no comments on the particulate control technologies proposed by the Department as BACT, as I mentioned a moment ago.

Further, SME's permit application and the Department's permit analysis do provide justification for the control technologies and emission limits determined by the Department to constitute BACT.

At the end of the day tomorrow, the preponderance of the evidence that has been presented to you over the course of two days will not support the Petitioners' allegations, and Petitioners will not have met their burden as plaintiffs in the case to prove that the Department acted unlawfully. Rather the evidence will show that the Department's BACT determination complied with BACT requirements, and was not unlawful. Thank you.

MR. REICH: Mr. Chair, if I might, I

have a few hand-outs I'd like to just pass around if I could. (Provides documents) We're just going to set up an easel.

MS. DILLEN: I have a housekeeping matter, Mr. Chair, members of the Board, just a brief housekeeping matter. I believe that Mr. Reich intends to present a demonstrative exhibit summarizing his argument. To the extent that it's being offered solely to demonstrate the points that he's making, rather than their correctness, we have no objection; but I do want to make sure that the Board understands that this is purely a demonstrative exhibit, not one that goes to the facts and evidence today.

MR. REICH: Members of the Board, Mr. Chair, my name is Kenneth Reich. Again, I represent Southern Montana Electric in this permit proceeding. We do thank you for spending the extra time to consider these important issues, and we hope that we'll be able to educate you on the issues involved in this challenge.

Now, once again, MEIC is pushing the Board to hold DEQ to a BACT analysis standard for PM2.5 that neither EPA, or the state, or any state has followed. MEIC is over-simplifying an

involved regulatory program, and would have this Board tread where no states have tread. Moreover, the BACT analysis conducted by SME and reviewed by DEQ was more than adequate for both PM10 and PM2.5.

MEIC raises several issues, and those have been discussed in opening. None of those issues have merit. First: Did DEQ err in its surrogate analysis, using a surrogate analysis for PM2.5? The answer to that is no, and you will hear from several witnesses, as well as a number of the documents that speak to that issue.

Did DEQ err in failing to evaluate the available and feasible controls for the PM10 and PM2.5? Again, you'll hear plenty of evidence on that subject, and the answer to that question is emphatically no.

And third, did DEQ err in not setting a lower emission limit for PM10 condensible and filterable? And the answer is absolutely not. They did not err.

As we discussed in our brief, and the Board is well aware, MEIC has the burden of proof here to show not that DEQ erred as a matter of discretion, but that DEQ erred as a matter of law,

and they must prove in these proceedings by a preponderance of evidence that DEQ erred as a matter of law.

Let's start with a quick summary of what is PM, and what is PM10, and what is PM2.5. You're going to hear about that from our witnesses. But basically PM10 consists of particles that are at a ten micron level or less. PM2.5 is a subset of PM10, and it consists of particles at 2.5 or less. And PM2.5, as does PM10, consists of filterable and condensible portions. The condensible portions are primarily gases, unlike hydrosulphuric acid and other acid gases.

Another aspect of PM2.5 or so-called precursors, that is compounds that once they exit the stack of a power plant or other facility end up in the ambient air, and then combine with dust from wherever to form what's called secondary PM2.5.

Now, you'll hear from our expert and other witnesses that all of these elements of PM10 were analyzed in the permit, and that the permit, both through EPA guidance and through the BACT analysis that were conducted, does adequately

control PM2.5.

Let's talk for a second about the surrogate analysis performed by DEQ. The surrogate analysis for PM2.5 using PM10 as a surrogate is appropriate, and it was not error for DEQ to use it. The analysis was done pursuant to EPA guidance that was in effect prior to the time of the application, at the time of the application, and currently in effect; and EPA follows it, and just about all of the states follow it.

You'll expect to hear from DEQ and SME witnesses about the practical problems of conducting a BACT analysis for PM2.5, and why they did the best they could, but the surrogate analysis really gives you the best tools. You'll hear about the key problems with PM2.5 BACT analysis, conducting one.

And the main problem that you hear about from both the SME witnesses and the DEQ witnesses is the lack of good basic data on what the emissions of PM2.5 from a power plant are, so-called emission factors. If you don't have that data, then you can't really conduct a BACT analysis. Your BACT analysis is stopped in the

first instance.

Why is that? The reason is because a BACT analysis goes through five steps. And at Tab 20, you have a little demonstrative on the BACT analysis. But perhaps you can just put that up for the Board. I'm not sure that is visible. But basically there is a five step BACT analysis. As I say, it's in Tab 20.

But the prerequisite to doing a BACT analysis is knowing what are the emissions from the facility before you start controlling them. If you don't know the emissions, you can't evaluate the efficiency of the control device; you can't figure out what controls are more cost effective or less cost effective; and ultimately you can't end up with a permit limit.

And you will hear from several witnesses and experts that emission factors that allow sources like Southern Montana's Highwood station to produce an inventory of PM2.5 emissions just aren't there yet. EPA has been saying this consistently. That's why they came up with a surrogate analysis. And just the data is not there in order to start the inventory. If you can't start the inventory, you can't even start

the first portion of a BACT analysis.

Now, there are other parts of the PM2.5 program that also are not in effect. There are no PSD increment values; there is no significance levels to understand whether a source is even subject to PM2.5; there is no modeling protocols to predict exceedences.

So basically the PM2.5 program started with the NAAQS, as Ms. Dillen indicated, but it's not completed. In fact, it's far from completed.

You'll hear from the SME witnesses and DEQ's witnesses that the permit reflects a BACT analysis not only for PM2.5 via the surrogate analysis, but also it does look at a number of the elements of PM2.5, including condensibles. That was all analyzed in the BACT analysis. So this was not just a BACT analysis that looked solely at PM10. It did look at condensibles, and as Ms. Dillen has indicated, there is a limit basically set for condensibles.

You'll also hear that DEQ went far beyond the EPA guidance, which really only requires that you match up your projected emissions of PM2.5 against the standard for PM10. SME went beyond that and modeled for compliance

against the PM2.5 national air quality standard, and found that there was compliance.

It also went beyond current EPA policy by setting a condensible limit. Condensible limits in permits for these kinds of facilities are a very new thing. And this was set in the DEQ's analysis for the Highwood Station, despite the fact that EPA guidance of just this year says, "Because of the problems with the data and the data verification, we're going to give the states a few more years before they need to put condensible limits in their permits." But DEQ went beyond that and put in a condensible limit.

So the surrogate analysis did the job it's supposed to do. It protects the environment, and it was in compliance with all applicable laws, including Montana laws.

Another issue is whether DEQ evaluated the full range of the top controls for PM10 and PM2.5, and you'll hear testimony that they did. They did look at -- All of the types of technology that MEIC says they should have looked at, they looked at, they did evaluate them, and they found they weren't applicable, weren't reliable, or were prohibitively expensive, to quote the Deserit

permit issued after SME's.

A final issue is: Did DEQ err in setting a permit limit for condensibles and filterables that was higher than some limits that are out there? You'll hear both from SME and DEQ witnesses and experts that the SME initially proposed a limit for filterable and condensible together that was higher than the limit that was ultimately set in the permit. So DEQ evaluated SME's BACT analysis. They didn't rubber stamp it. They actually chopped down the limit to a permit limit of .026 total, .012 filterable, and that's certainly in the ballpark of any facility that is out there. One of the lowest in the country.

You'll further hear from experts and witnesses that a BACT analysis doesn't achieve the lowest limit for anywhere in the country. The BACT analysis is a site specific, case specific analysis that takes into effect costs, energy, and so forth, and then you come up with a limit based on the controls. You don't just look out there and find the lowest limit and put that in the permit. If you did that, you wouldn't need a BACT analysis. You could just throw in a permit limit.

But the issue with BACT is: Is it

achievable? Is it feasible? Is it achievable? Is it economic? All that has to be looked at; all of that was looked at in this permit analysis.

So in conclusion, again, MEIC has the burden of proof that DEQ erred as a matter of law. We submit after the Board hears all of the evidence that you will find that MEIC has not met that burden to show that DEQ erred as a matter of law, and at that point, we would request the Board to dismiss the appeal and uphold the permit. Thank you very much.

CHAIRMAN RUSSELL: Apparently all those lunch menus that we filled out, the Jailhouse is closed for remodeling, so we're going rip these back around. Because of Board members' scheduling, we're going to take a lunch break 12:30. So hopefully that works, and --

MR. REICH: Would it be possible to take a quick rest break, five minutes?

CHAIRMAN RUSSELL: Yes. Five minutes.

(Recess taken)

MS. DILLEN: I'd like to call my first witness, Mr. Hal Taylor.

(Witness sworn)

HAL TAYLOR,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MS. DILLEN:

Q. Mr. Taylor, could you state your name and address for the record, please.

A. Yes. My name is Hal Taylor. I'm at 26125 West Laurel Avenue, Wauconda, Illinois.

Q. Can you tell the Board what your current occupation is.

A. Currently I'm a consultant. Most of my work is in the environmental end on the hardware side of things.

Q. By "the environmental end," could you explain what you mean by that.

A. Emission control for various sources, such as boilers, and metallurgical sources, mining, that type of thing.

Q. Who are your clients generally?

A. Typically my clients are the industrial sector. Once in awhile I get involved with the utility sector. And the only reason for that is they usually go to the big guys.

Q. Can you tell us a little bit about your

educational background.

A. Yes. I have a degree in engineering science, nuclear option. So originally I was looking at becoming a nuclear engineer in the nuclear industry, but when I graduated in 1969, most of those jobs had pretty well dried up, so I went into other areas.

My first job was Underwriters Laboratories in Chicago, Illinois, where I was in the Hazardous Location Equipment Department, where we analyzed electrical equipment for installation in hazardous locations which would have gaseous pollutants or particulates, and we were looking at those to prevent explosions and fire hazards.

I was there about year and a half, and the opportunity came up to get into the environmental field, and because of my work in carbon monoxide explosions, I was hired by a company that was having problems with one of their pollution control devices that continuously kept exploding while it was in operation. So they hired me expecting that I'd be able to help them along those lines; and unfortunately I did the analysis of their equipment, and found there was really nothing they could do to prevent that

problem. So it kind of got me out of that job and into others.

Q. Can you tell us where you landed next.

A. Next I was in the same company, put me in the Research and Development Department. And at the time in the emission control field, metallurgical applications were the ones that people were making equipment to control the emissions from; and in order to do that, we had to characterize those emissions so that we could design pollution control equipment to curb those emissions.

Q. Mr. Taylor, what sort of emissions were those?

A. They were from metallurgical furnaces, so they were very fine particulate emissions. Most applications, 50 percent of the particulate would be less than five microns in size.

Q. Can you explain your role in creating emissions inventories and controls.

A. Yes. Well, at that time there wasn't a whole lot known about what particles were generated by these devices, and so we actually performed pilot testing to determine that. We would go out, run a pilot test of a basic design

of an emission control device; install it on an existing source; and conduct particulate, inlet and outlet particulate test to determine what was coming out of the source into the pilot unit, and what was coming out of our pilot unit, based on operating conditions, it would adjust to achieve higher efficiency rates.

Then we'd take those particulate samples and analyze them in order to determine particle size, morphology -- in other words, shape of the particle -- as well as speciation, in other words, what the particle was made -- what it consisted of.

Q. And then once you knew what sort of particles were being emitted, what was the next step?

A. Well, the next step was to design a system that could address the capture of those particles.

Q. Were you responsible for helping to design those control system?

A. Yes. My primary duty was in the specific design of emission control equipment for those applications.

Q. How long did you spend in this capacity?

A. I was in that capacity for about three years. Then I went into project management, where we did the installations, and went ahead with the projects in order to control source emissions.

Q. Was this with the same company?

A. That was with the same company. The company was Riley Stoker Corporation, which is a boiler design and manufacturing firm.

Q. And what was your position within that Department?

A. Well, I was project manager for a number of years, and then I became chief engineer.

Q. And in your capacity as chief engineer, what were your responsibilities?

A. Well, I was responsible for the Design and Development Department for the Construction Department, which did the installations of the equipment for our Service Department, which serviced our equipment. Since it typically would last about twenty years, we had a lot of service that was done on our equipment, as well as the manufacturing of the specific products that we made.

Q. While you were chief engineer and even before, did you have any occasion to consider

particulate control systems in particular?

A. Could you rephrase that, or repeat that?

Q. Sure. During those years that you were doing project management, and then when you became chief engineer, did you have any project that involved control of particulate matter emissions?

A. Yes. Most of the work that we did was the control of particulate matter, at least at the onset of my career there. Later we moved into sulphur dioxide removal for the power boilers that we manufactured.

Q. Did you have any occasion to be working with the utility sector and power plants?

A. Yes. We did installations of power plant emission control systems primarily tied to our boiler, or furnishing our boilers for these power plants utilities.

Q. You indicated that you were there for three years, and what was it that you did next?

A. Well, I was with Riley for ten years, and it was like three year stints in each -- approximately three years stints in each area. Following that, I went to FMC Corporation, and I was with their Environmental Group, and our primary, let's say, objective was to install flue

gas to sulphurization systems on utility boilers, as well as boilers and other equipment that generated sulphur dioxide in the industrial sector.

Q. Does this process of desuphurization involve particulate emissions and their control in any way?

A. Well, typically -- at least this was how this was done then -- is you would control particulate discharging from a boiler, and then you would control sulphur dioxide. It was a two step process. And typically at that time, the particulate emission control of choice was an electrostatic precipitator, dry electrostatic precipitator. And then most of the desulphurization systems were wet flue gas desuphurization systems, which used some type of reagent to adsorb the sulphur dioxide from the gas stream, and that reagent could typically be ground limestone, lime, soda ash, caustic soda, magnesium oxide, a number of reagents that were used.

Q. So at this first stage when you were considering particulate emissions, were you considering this at any utility power plant?

A. Yes. All our installations were deeply

involved with the design and installation of the emission control devices for particulate.

Q. Were any of those coal fired power plants?

A. They were all coal fired power plants.

Q. After you left FMC Corporation, where did you go?

A. I started a small environmental equipment company, Advanced Air Technology, and we designed and installed custom air pollution control equipment, mostly for the industrial sector.

Q. Is that where you're currently employed?

A. No. I sold my company, and took a little bit of a hiatus, and then was kind of roped back into doing some consulting for someone, and so that's what I'm doing now.

Q. In your long career, have you ever had any occasion to conduct a BACT analysis?

A. Yes, I have.

Q. About how many BACT analyses would you say you've performed?

A. Approximately 100.

Q. Have any of those analyses dealt with control of particulate matter?

A. Yes. A number of them did, yes.

Q. And at issue was control of fine particulate matter?

A. Yes, it was control of fine particulate matter. Actually the BACT -- we didn't really go into it looking at control of fine particulate matter, but it just turned out that we had to look at it that way in order to meet the emission requirements.

Q. Could you explain why that was, and give us some details --

A. For example, one example, it was a petroleum coke fired boiler, a power boiler in a paper mill, where they were using the boiler to generate steam for their paper making process, as well as generating some electricity with a turbine generator.

The problem they had there is they had a visible emission, and they had been cited for it a number of times. This was an existing unit. So they went and had a firm do a BACT analysis. It was determined that they had to make some modifications to their existing system, and they proceeded to make those modifications, but it was not solving the problem. So I got involved in a

troubleshooting process, which led to another BACT process, which led to the selection of a different technology than the one they had previously started to put in for their -- as a result of their BACT analysis, and that solved the problem.

Q. Was the problem essentially emissions of particulate matter that was within the 2.5 size range?

MR. REICH: Objection, leading the witness.

Q. (By Ms. Dillen) What was the problem?

A. The problem was visible emissions, and those visible emissions were caused by reflective particulate, that was very fine particulate, and most of it was below three microns in size.

Q. What was the solution that your BACT analysis came up with?

A. Well, in that case, the solution was -- This was an existing fabric filter baghouse, and the solution was to change the bag type, and we changed it to what's classically termed a membrane bag.

Q. Have you had occasion to review the air permit that was issued by the DEQ to the SME Highwood Generating facility that's challenged in

this case?

A. Yes, I did.

Q. Are you familiar with the -- Could you identify the technologies that were considered in the BACT analysis for particulate emissions.

A. Well, they considered dry ESP's, as I recall, and they considered a -- They looked at wet scrubbing. I'm looking primarily at the ones that they considered as BACT, where they did the economic analysis, and they considered a fabric filter baghouse; and as I recall, those were fiberglass bags, as well as coated bags.

MR. REICH: Mr. Chair, just before we go any further, it sounds like he's going to get into substance of his testimony --

MS. DILLEN: Mr. Reich, I'm establishing his credentials to comment on these control technologies.

MR. REICH: Thank you.

Q. (By Ms. Dillen) Have you ever worked with these control technologies before?

A. Yes, I have.

Q. And how often would you say you've had occasion to work with these various technologies?

A. Well, as far as the electrostatic

precipitation, it was just about -- In my early career, everything that we did in the power side had an electrostatic precipitator, so there was probably 30 some installations of utility boilers that I worked on. As far as the fabric filtration, probably 200, 300 installations. And most of the rest of the installations were wet scrubbing and absorbers.

Q. Have you had experience with dry electrostatic precipitators as well?

A. Yes. Most of my experience is with the dry electrostatic precipitators. In other words, all the ones I discussed at the beginning for the utility end of it, at Riley as well as at FMC, were all dry with electrostatic precipitators.

Q. Just to make sure we're clear on this, have you had experience with wet electrostatic precipitators as well?

A. Yes, I have. Most of that experience is on incineration processes. I have not had any direct experience on utility boilers.

MS. DILLEN: Mr. Chairman, members of the Board, we tender Mr. Hal Taylor as an expert witness on the control technologies available for fine particulate matter.

MR. REICH: May I be heard?

CHAIRMAN RUSSELL: Unless I hear anything from Katherine.

MS. ORR: Are there any objections?

MR. REICH: Yes, two objections. Members of the Board, the first is a general objection that Mr. Rusoff made during the -- reiterated during his opening, which was that the purpose of this hearing is not to have the Board do a BACT review. That's what DEQ did. So to the extent that we're going to get into extensive testimony about different technologies, or reading them and so forth, we would contend, "A," that was already done, and "B", it's really not the province of the Board.

The second objection is Mr. Taylor just -- I think the last statement he made is that he said he has had no experience with respect to wet ESP's for utility boilers, and my understanding from his expert report and from his deposition is that he intends to testify about wet ESP as a technology that should have been evaluated by the DEQ. To the extent that he doesn't have that expertise with respect to utility boilers, I'd object to him being allowed to be an expert on

that issue.

MS. DILLEN: First with respect to the propriety of hearing Mr. Taylor's testimony on control technologies, one of SME's contentions in this case is that would be a worthless enterprise to go back and reconsider BACT for PM2.5 because there would be nothing else to consider, and that's a contention that we would like to rebut with Mr. Taylor's testimony as to available technologies.

He has not conducted a BACT analysis for this facility; he is not going to be testifying as to what limits could be achieved, what limits should be imposed, but he is going to give the Board some background on what technologies are out there to be considered. And we believe that's fully within the scope of these proceedings.

With respect to the second objection as to Mr. Taylor's qualifications, I can perhaps ask Mr. Taylor some additional questions which may give the Board some more comfort as to his ability to discuss the potential for use of a wet ESP in a coal fired boiler situation. However, I would say that his testimony so far has evidenced a substantial experience, decades of experience with

particulate emissions controls, and with wet ESP's in particular. A BACT analysis does not require that a control be used on a particular facility in advance of considering it.

Let me take a step back. When you do a BACT analysis, you can look at all sorts of technologies that are used for all sorts of applications. So long as they're transferable to the plant that you're considering, they're certainly relevant to your analysis. And if the Board would like to hear further testimony as to the applications where Mr. Taylor has considered a wet ESP and its relevance to this proceeding, I'll be happy to take him there, but I do want to keep this testimony as brief as possible, given our time constraints.

CHAIRMAN RUSSELL: I'm a little intrigued on the level of expertness regarding wet ESP, so if you want to --

MS. DILLEN: Sure.

Q. (By Ms. Dillen) Mr. Taylor, could you explain to the Board when you've had experience with installing or servicing or overseeing the use of wet ESP in the past.

A. Yes. The first experience I had was in

a mining application, and it was for a taconite pelletizing kiln. And typically -- and I don't want to belabor this and get too long -- but typically in the mining industry for iron, your lodestone, your magnetite, all your high easy to get iron ore on the iron ore range in Minnesota, it's pretty much depleted.

And so the only thing that's left is a very hard shale-like material that has about 25 percent iron in the ore body, but it's rather hard to get at because you have to grind up this material that's extremely hard, and then powder the material, separate it magneticall. It's pelletized or put into little round spheres or balls about the diameter of a dime. And then to make it handleable, because the ball is just -- part of this is clay, so it's a very soft product -- they indurate it -- at least that's the term they use -- which is basically firing a kiln, heating it up to 2400 degrees Fahrenheit to fuse the particles together to make it a handleable particle. And then they can ship that via train, boat, or whatever, to blast furnaces and other people that would use the iron ore.

Their emissions from that kiln are very

similar to a metallurgical, a combination of metallurgical and boiler emissions because they use the same fuels. They use coal, petroleum coke, gas, oil, and then wood, and combinations thereof.

So the emissions coming from these kilns are often very, very small, below three, four microns, a predominant number below one micron. And so they have visible plume emissions, which of course are the first indicator to an authority that they're having a problem. And so some of the customers that I was involved with elected to go the electrostatic precipitator route, and they put in dry precipitators, and those did not work too well.

And again, I won't get into the reason why, but it was basically because of the resistivity of the dust. The dust has to have a certain resistivity for a dry electrostatic precipitator to work. There is things you can do to enhance that precipitation by changing the resistivity of the dust, but on a large scale, that's often difficult.

So then they explored the use of the wet electrostatic precipitators, and that's where I

got involved with the project.

Q. Is this typical of your work? Do you often do BACT analyses where you identify available technologies?

A. Yes.

Q. And available technologies for pollution control?

A. Yes. That's pretty much all I do.

Q. And have you ever considered whether a wet ESP might be an effective control technology for a coal fired boiler at a power plant rather than in a metallurgical application?

A. No, I have not done a BACT for a power plant for a utility.

Q. Apart from a BACT analysis, have you ever considered it?

A. Yes, I have, for -- I have done a BACT, but not for a boiler. For incineration processes.

Q. How is controlling emissions from an incinerator different from controlling emissions at a coal fired power plant?

A. Well, typically, the incinerator again, very similar to the induration furnace I was discussing, has very high outlet temperatures; and so as a consequence, you tend to have more

condensibles, more particulate below three microns in diameter. And so it's a very difficult source to control. Fabric filtration is used, but one of the problems with high temperature systems is you can often, if you don't control your temperatures properly, you can catch your baghouse on fire, and that basically puts you out of business for awhile.

So the precipitation is more forgiving, and the wet precipitator is a very efficient emission control device.

Q. Is it more difficult to capture particulate matter including very fine particulate emissions at an incinerator than it is at a coal fired power plant, a coal fired boiler?

A. I would say it's going -- With a wet electrostatic precipitator, it's going to approximately be the same, other than the issues you have with temperature control.

Q. In reviewing the permit that's at issue in this case, did you ever do any research on whether wet ESP's have been used for applications at coal fired power plants?

A. Yes. I looked through some listings, and there are a number of wet ESP's installed on

power plants.

Q. Is that kind of research, looking at listings and possibilities, something that you do in the regular course of your work?

A. Well, when I'm trying to find out the -- either do a BACT, or help a customer try to select an emission control device, yes.

Q. Is there anything you would like to add with respect to your experience with wet ESP's?

A. The other area I've gotten into heavily in wet ESP's is a metallurgical selection. Because I've had so much wet scrubber experience in acid gases, I've done quite a bit of work with some of the wet ESP manufacturers to give them some direction as to what materials for construction they should use for various applications.

MS. DILLEN: Mr. Chair, members of the Board, we tender Mr. Taylor as an expert on identification of control technologies that could be considered in a BACT analysis for fine particulate matter including wet ESP's.

And if I should be addressing these to you, Ms. Orr. I'm not sure how this process should work.

MS. ORR: Can I answer that, Mr. Chair?

CHAIRMAN RUSSELL: Yes.

MS. ORR: Mr. Chairman, members of the Board, Ms. Dillen, I'm only here to make recommendations. I'm not here to effect any decisions. So I would address myself, if I were you, to the Chairman.

MS. DILLEN: Thank you.

CHAIRMAN RUSSELL: You've used PM3 a couple of times. Is there some --

THE WITNESS: That's my fault. There are certain issues with particulate above three and below three. The EPA has come up with PM2.5. I think it's more of a health issue size for physiological. You know, the particle goes in the lung, and doesn't come out. In the air pollution control end of it, when you're dealing with fine particles, the PM3 is kind like of the magic number of particle size where it starts to act different than a particle in the gas stream, and starts to act more like a gas molecule in the gas stream.

So when you're conveying these fine particles, there is a difference between the ones that are above three and below three. That's just

my problem, because I've always looked at it that way, and I don't think about the physiological issue.

CHAIRMAN RUSSELL: Are most of the control technologies built around that diameter?

THE WITNESS: No, it's just that's like a magic number diameter to where you have to look at how the particle acts in the gas stream. In other words, let's say I'm going to use a cyclone to take out a particle. You take out -- The cyclone imparts a tangential or a circular motion of the air in a vessel, and the particle wants to go straight, in other words, and hit the wall, and then drop out.

When a particle gets to be around three microns in diameter, it starts to act more like a gas molecule, and it doesn't care. So you don't take it out with that inertial force.

CHAIRMAN RUSSELL: Thank you. That's good. I'll take a motion to --

MR. ROSSBACH: So moved.

CHAIRMAN RUSSELL: The motion is to accept Hal Taylor as an expert witness. Is there a second?

MR. MARBLE: Second.

CHAIRMAN RUSSELL: It's been moved and seconded. Any further discussion?

(No response)

CHAIRMAN RUSSELL: Hearing none, all those in favor, signify by saying aye.

(Response)

CHAIRMAN RUSSELL: Opposed.

(No response)

CHAIRMAN RUSSELL: All right. Thanks.

Q. (By Ms. Dillen) Mr. Taylor, we've started to get into this already, but I think it would be useful for the Board if you could explain what PM2.5 is.

A. Well, again we just started into it, but PM2.5 are particles, both filterable and condensible, that are below 2.5 microns in diameter, and these come from various -- well, all emission sources that involve combustion have particulate that is in that 2.5 and smaller range.

Q. And could you explain what the difference is between condensible particles versus filterable particles.

A. Your filterable particles are a physical solid. Your condensible particles can be either in the form of an acid gas or a fume, and a fume

would be -- Let's say you melted lead, so you'd wind up with a fine metallurgical fume of lead, or you could add sand and get silicon dioxide, and that would be a fine fume. So these two components, the condensible particulates and the filterable particulates, form PM2.5.

And again, when they term it condensible, these are items that would condense under certain conditions, either atmospheric, or when you quench them in a pollution control device. Adding water to it and the like would tend to make these items condensed and come out in their form prior to heating. So in other words, your H2SO4 would be your sulphuric acid, which would be a mist or fine aerosol that would come out as an acid combined with water.

Q. Just stepping back a moment, maybe it would be useful to use a concrete example of how a coal fired boiler -- and we can use the CFB boiler as an example -- how do PM2.5 emissions result from the boiler process?

A. Well, in the boiler in question -- although I don't know the specific design of this boiler. As far as being a fluidized bed, there's many fluidized bed boilers. But typically, a

fluidized bed boiler controls its combustion very accurately, and it combines typically an aggregate, like limestone, powdered limestone, that acts to gather SO2 from the coal as it's being burned, in a bed that's fluidized by either bubbling air through it, or recirculating the bed over a sand screen, or something like that. Again, that depends on the specifics of this particular boiler.

But basically you have this fluidized bed, you have combustion going on in the bed, you're combusting your coal, absorption is going on with the lime or limestone that you have in there, and you're generating -- As you combust, of course, you're generating products of combustion, and fly ash, which is incombustible, and that has to go somewhere. So some of the fly ash and limestone particles that don't get to be small enough travel out the bottom or the ash pit inside of the boiler, and the rest become airborne and go out of the stack.

Q. So what would be the first step to controlling that category of particulate that's first coming out of the boiler before it reaches the stack?

A. Well, the first step is to characterize the particulate and gaseous emissions coming from the boiler.

Q. And so if you characterize some category of larger particles, how might you control those?

A. Well, typically you'd control those with a cyclonic separator.

Q. Can you explain what that is.

A. Well, a cyclone usually a cylindrical vessel that you pass the air flue through it. A cylindrical vessel. You enter the gaseous tangentially with whatever particulate and gaseous matter are there, it moves in a cyclonic action, sort of like a tornado. The particulate that's heavy enough gets thrown to the outside, and falls down to the bottom to be conveyed away via some type of conveying system.

It's a crude device, but it does collect particulate from approximately ten microns in size up to the largest that's coming out of whatever the device is. It certainly doesn't collect all ten micron particulate or all of the twenty micron particulate. Typically it starts to be of absolute efficiency, in other words taking all the particulate, about 75 microns, so you still have a

lot of large particulate exiting that device.

Q. So if you wanted to go further and you wanted to control more of the smaller particles, at that point what might you consider adding to the boiler in the way of a control technology?

A. Well, there is any number of devices you can add. One, you could add a wet scrubber. Typically what's done on boilers are a utilization of a Venturi scrubber, which accelerates the gas through a small opening; and by virtue of the acceleration, you get impaction and coalescence of your particulate into an aqueous or water, and that removes the particulate from the gas stream. You can use fabric filtration.

Q. Can I stop you a moment. Just with respect to the scrubbing devices that you talked about, how small of a particle size range can you capture with a scrubbing device in general?

A. Well, you can capture submicron particulate. It's a matter of how much energy you want to use to do that. So many metallurgical applications use Venturis and other types of wet scrubbers today, but they're very high energy. They'd probably be --

For example on a blast furnace -- which

has very fine particulate. Most of it is below two microns in size coming out. If you were to use a fabric filter versus a wet scrubber, irrespective of temperature problems or the like, to control the particulate coming from that, you would probably have something in the neighborhood of ten times the energy usage, which is primarily from your fan, just because you need a high pressure drop across that Venturi to create enough energy to break up the droplets to a small enough size where they can coalesce with the particulate. So it's a more energy intensive device for fine particles.

Q. I interrupted you. I think you were about to move on to another technology option that you would have after you had captured the biggest particles with the cyclone.

A. Again, I said a wet scrubber would be a choice, and it has been used; not in recent past, but it used to be in the day. You have electrostatic precipitators.

Q. Can you explain what electrostatic precipitators are?

A. Basically an ESP is an emission control device that collects particulate by imparting a

charge on the particulate passing through it, and imparts either a positive or negative charge on the particle, and then it has a positive or negative plate. So you have the opposite attracts.

So let's say you put a positive charge on the particle, and you have a negative plate or collection area, and the particle migrates toward that negative, and then it is removed by either shaking the plate, by washing the plate off in the case of wet electrostatic precipitator, vibrating.

Q. I think you're alluding to it, and we've discussed earlier wet ESP's versus dry ESP's. Could you explain in more detail what the difference is.

A. I think I mentioned earlier about resistivity issues with the taconite induration process, and the problem with the dry ESP because of that. The wet --

Q. You might want to remind us what all these crazy terms, like induration and resistivity is.

A. Induration is really -- it's a kiln that is used to heat up the taconite pellet and fuse the particles together. So that process is called

induration. Why, I don't know. It's a term used in that industry.

Q. Could you explain how that relates to the difference between dry ESP's and wet ESP's.

A. What I was getting at is the particulate coming from that induration process has a resistivity -- and again, I don't want to go into a big primer on it, and I don't think you want me to on ESP's. But resistivity of particles has a lot to do with the efficiency of an ESP, a dry ESP. And so what's nice about the wet ESP is because you're using water in there, and it's sprayed in there, really has the resistivity of water, which is easily collectable by electrostatic precipitators. So it's a much more efficient device than a dry ESP, as far as particulate.

Q. What do you mean by efficient?

A. Efficient as far as particulate collection.

Q. What does that mean in terms of controlling fine particles?

A. Well, it's a very efficient -- On the hierarchy of emission control devices, the wet ESP for most applications is probably the most

efficient emission control device that you can put on a process.

Q. Is that true for particles in the finer 2.5 size range as well as other larger particles?

A. Yes. It's primarily in that particle size. What ESP's were developed primarily to handle were acid mists coming from acid plants. That's when they first came about. And most of those mists are condensibles, and aerosols, and they're all below 2.5 microns.

Q. So when we discussed earlier the difference between filterable solid emissions and condensible, these more gaseous emissions, are you saying that the ESP targets specifically the gaseous condensible emissions?

A. It was used to target that, but it handles both very efficiently. So it handles filterable as well as condensible.

Q. So if you were looking to control the whole realm of particulate matter, both filterable and condensible, would you think about using a wet ESP?

A. Definitely. When I have done my BACT analysis for particulate, that's the number one on my list.

Q. Can you explain to the Board. You mentioned a third technology, which is a fabric filter baghouse. Could you explain -- and remember, we're all lay people here -- how that system works.

A. Well, I usually compare it to just something that most everybody knows -- maybe they're not happy about knowing -- but a vacuum cleaner. Typically not the bagless type today, but the type with a bag.

You draw the air through the suction hose into a filter bag, and that bag does the filtration. Typically in a vacuum cleaner, the bag is made of paper, and it's a very fine, not that porous of paper, and so you're really doing a lot of the filtration with the paper first. But as that bag starts to plug up or get dirty, the filtration through that bag improves by virtue of the fact that the dust that's built up on the bag is doing further filtration.

A baghouse for any application works much in the same manner. You have a multiplicity of bags inside a large housing, and you draw your gas with particles in it into that baghouse, and the particles are deposited on the surface of the

bag.

At the onset, with a normal bag at the onset of this process, the baghouse emits quite a bit of particulate, because what happens is the fine particles are going right between the weave. As you operate a longer period of time, the bag filter builds up a layer of dust on it, and that dust actually does your filtration. And so you continue on until that -- In your vacuum cleaner, you continue on until the bag plugs, and then you'd replace the bag.

In the industrial application with the baghouse, you go until you have a certain pressure drop or resistance across the bag, and then you clean the bag. And there is a number of ways to do that. When baghouses were first started to be used somewhere around the early 1900's, they'd just shake the bag. They had a mechanical device that would shake the dust off the bag. Later on, they'd reverse inflate the bag by a number of ways to, let's say, inflate it, change the shape of it, like blowing it up like a balloon, and then some of the dust would fall off.

Q. Taking a step back, can you give us just a mental picture of what a baghouse looks like.

A. Well, typically your baghouse for normal applications is a large rectangular vessel. It usually has a collection hopper on the bottom where the dust that's been collected in it, when you take the dust off the bag, it falls down to the bottom of this hopper, and it's conveyed away. You have a center section where the bags are above the hopper. And then above that, you have what they call the clean air plenum, which is on the clean side of the bags, which acts to collect the clean gases, and they exit that portion of the baghouse.

Q. Is a baghouse -- How big are they generally? I know they vary.

A. Very large. If we looked at this room, for example -- you have to bear with me -- but this would probably be what you'd call a 75,000 ACFM baghouse size, just the center section. So we have -- what, are these ten foot ceilings here or twelve? Anyway, you could put enough bags in this area to probably filter 75,000 ACFM, not counting the hopper which would be below us, and not counting the clean air plenum which would be above us. Obviously the question that we're talking about is more than ten, twelve times that

size.

Q. Can you give us a ballpark figure how many of the actual bags you would have in the house.

A. Well, that depends on the technology. It's hard to exactly comment, but I would say it's in excess of 8,000 bags. I may be wrong, not knowing the specific technology of bag was selected. And if somebody could correct me.

Q. So knowing how many bags there are, is it important, when you're determining how effective your baghouse is going to be, to consider what kind of bag you're purchasing for the baghouse?

A. The bag is the key component of the baghouse. The rest is just a housing to hold the bag.

MS. DILLEN: We can take a break now.

CHAIRMAN RUSSELL: Why don't we take a break right now. Hopefully when lunch gets here, I think we're going to stick very close to here, so it might be good if we all do that.

(Lunch recess taken)

CHAIRMAN RUSSELL: Let's go.

MS. DILLEN: Before we left, we had been

discussing baghouses and bags in particular, and we want to go fast. And to that end, if there is any confusion that the Board has that we could clear up by a question from you, feel free to ask it.

Q. (By Ms. Dillen) Mr. Taylor, are there different kinds of bags that can be used in a baghouse?

A. Yes. There is probably over 100 different types of materials that can be used, and then there is various finishes on those materials.

Q. Do different bags have different control efficiencies for the smallest types of particulate matter? And we are talking here today, of course, about PM2.5.

A. Well, the bag that I described before really, all bags work basically in the same way, no matter what material they're made from. They work by having particulate build up on the outside surface or the inside surface of the bag, depending on the bag house, and that filled up of particulate becomes the filter.

There is one other type of bag that does not depend upon that filter build-up to filter particulate, and that is the membrane bag. And

basically the membrane bag just uses the filter, the woven filter bag as a substrate over which this membrane is placed. And if you can picture the membrane as sort of like a screen or a sieve with a precise size limit that it will pass of a filterable particulate. And in the case of a teflon membrane bag, that's in the range of .5 microns.

Q. So can you summarize for us what the differences are between the bags that you discussed earlier, the coated bags versus the membrane bag which you've just talked about.

A. Well, the first bags again that I discussed were really using the particulate that was in the gas stream to form the filter -- and they call it a filter cake -- on the bag, and that does your filtering. Obviously that has down sides to it: The time it takes to build up that filter cake, the wear that occurs when the filtered material gets between the bag fibers and tends to abrade the bag and destroy it over a period of time.

When you clean the bag, the filter cake may not be removed evenly, and that permits uneven gas flow in the baghouse itself, which causes

other issues, and wear on certain bags, higher emissions in some areas than others. A membrane bag tends to alleviate those problems, just because it's really not depending upon that filter cake process to do the filtration.

Q. Is the membrane bag any more efficient at controlling small fine particles?

A. It's the most efficient bag available.

Q. Have you ever installed membrane bags or called for their installation in any project that you've worked on personally?

A. Yes, I have, on a number of occasions.

Q. Could you give us a brief summary of your experience to the extent that you know how the membrane bags have worked over time.

A. Well, the one that's probably closest to this application again was resulting from a BACT that I had conducted on that petroleum coke fired fluidized bed boiler. That had normal bags or regular glass fiber bags in it, and they had a lot of failures, and they were having lots of problems as far as emissions goes, and fine emissions in particular, visible emissions that would tail off quite a bit. And again, these were all filterable particulates.

And we retrofitted that with the membrane bags, and prior to the retrofit of the membrane bags, they were changing bags out in various compartments of this device on a quarterly basis. Once we put in the membrane bags, they not only got rid of their particulate emission problems, both visible and measured, but their longevity of the bag. The bag life, the last time I checked, it's been a little over five years now, and they have not had any massive bag replacements in that baghouse.

Q. Do you recommend using membrane bags to your clients who are employing baghouses to control their particulate emissions?

A. Yes, I do. That's one of the things I recommend right away.

Q. Why do you recommend that?

A. Because it is such an excellent device for fine particulate, and it lasts a long time. It's a low maintenance bag.

Q. Do your clients find that it's cost effective?

A. After they get over the initial cost, yes. Again, you have two costs involved in all of these, and one is the capital cost initially, and

then the other one is the operating costs, and they usually -- As I've seen, they make it up on the operating costs then.

Q. Taking into account these technologies that we've discussed this morning, do you think it would be possible to do a BACT analysis for PM2.5 emissions from a coal fired power plant such as the HGS?

MR. REICH: Objection. I don't think there is any foundation laid for the question about whether it's possible to do an analysis. Maybe you need to take him -- He's only testified about technology.

MS. DILLEN: Agreed. I intend to take him through what a BACT analysis would entail.

MR. REICH: All I was saying is let him do that before she asks the ultimate question.

MS. ORR: Mr. Chair, I think we could use a little more foundation. That would be my recommendation.

Q. (By Ms. Dillen) Mr. Taylor, have you reviewed the permit that's been issued, the air permit that's been issued for the Highwood Generating Station?

A. Yes, I have looked at it.

Q. And I'd like you to discuss how you might undertake a BACT analysis for PM2.5. Could you begin by telling us what the first step you might take would be in doing a BACT analysis specifically targeted at PM2.5 emissions.

MR. RUSOFF: I've got an objection to him testifying as how he would do a BACT analysis without some foundation as to his expert experience in actually conducting a regulatory BACT analysis.

MS. DILLEN: We've established that he's conducted 100 regulatory BACT analyses for particulate matter and fine particulate matter.

MR. RUSOFF: His testimony wasn't that he conducted regulatory BACT analysis. He said that he had done BACT analysis. But if I could voir dire the witness for a minute, then I could potentially withdraw my objection.

MS. DILLEN: Go ahead.

VOIR DIRE EXAMINATION

BY MR. RUSOFF:

Q. Mr. Taylor, of those BACT analyses that you have done, have any of those been done for a regulatory agency?

A. Yes. Well, directly for the regulatory agency or the client. They've all been done for a client who was working with a regulatory agency.

Q. Were those part of a permit application to a regulatory agency?

A. Some of them was for permit, some was for retrofit PSD type things.

Q. Did you complete the entire BACT analysis yourself for all of those?

A. I completed the entire BACT analysis except for the final economic evaluation. In other words, I took the BACT analysis as far as the costs per ton of emission removed, and then that was turned over to the client.

Q. Do you recall your deposition in this case that was taken on Friday, November 9th, 2007?

A. Yes.

Q. And do you recall discussing what your level of participation was during that deposition? Do you recall discussing what your level of participation was in the BACT analysis that you've worked on?

A. Well, I said it was from the technical end, in other words, the technologies and the sizing of the equipment, the cost of the

equipment, the design of the equipment and installation.

Q. Do you recall testifying that, "I was looking at emission control equipment, as well as figuring out the dollar per ton of emission removed"?

A. Yes, that's correct.

Q. And there are other steps involved in a BACT analysis in addition to those steps, aren't there?

A. Yes.

Q. And have you completed those other steps in the BACT analyses you've done?

A. You mean as far as selecting the hierarchy of control?

Q. Yes, determine, actually ranking the control efficiencies, and evaluating the various available control technologies in terms of energy and environmental --

A. Right. Those are all --

Q. Have you ever been involved in evaluating the available control technologies in terms of the environmental, energy, and economic impacts of each technology?

A. Yes, I have.

Q. And then have you actually yourself selected the control technology as BACT in those BACT analyses?

A. I've made recommendations without the knowledge of what was the economic level or factor. In other words, that was not privy to me when I turned in my analysis.

Q. Do you recall testifying in your deposition that in those BACT analyses, you were always working with other people on those BACT analyses?

A. Oh, yes.

MS. DILLEN: Objection. I'm starting to lose the thread of why this is --

MR. RUSOFF: I guess I'm trying to establish whether or not he has actually completed an entire BACT analysis himself.

MS. DILLEN: I guess what I would like to do is lay the foundation of what the steps of a BACT analysis are, and how Mr. Taylor might approach them in this regard. The issue before the Board is whether a PM2.5 BACT analysis is impracticable. And what Mr. Hal Taylor will be addressing is the practicability of identifying technologies, their control efficiencies, and how

you might go forward ranking them; but he's not attempting to say what a BACT analysis would come forward with in this instance.

MR. RUSOFF: I guess I was just trying to establish whether or not he has sufficient experience with all of the five steps that are commonly performed in a BACT analysis to testify to that.

CHAIRMAN RUSSELL: I think we'll keep moving on this. You're duly noted. But I think we'll lay some more foundation, and certainly redirect.

MR. RUSOFF: In view of his responses, I withdraw my objection to responding to the questions that were asked.

DIRECT EXAMINATION (CONTINUED)

BY MS. DILLEN:

Q. Mr. Taylor, if you were asked by a client to think about how you might achieve the maximum emissions reductions in PM2.5 emissions for the Highwood Generating Station, how would you begin to think about that?

A. Well, first I'm going to assume that the power source has already been selected. Typically

when I get involved with BACT, it's mostly been on sources that were already installed or selected.

If that wasn't the case, I'd certainly want to get involved in looking at the source itself, just because there is certain things that the source can do to mitigate emissions, but that --

Q. Can you just quickly explain what you mean by the source and what it would do.

A. In boilers, especially if you look at a normal stoker fired boiler, there are some things that can be done to enhance combustion and minimize particulate emissions, as well as minimize SO2 and NOx formation, but that's pretty much it. When you look at a fluidized bed boiler, it can do a lot more to minimize NOx. It can actually do SO2 control in the boiler itself, as well as a pretty good job of controlling your larger fly ash particulate; and that's just because of the characteristics of the design of that boiler.

Q. How would you find out what one boiler's PM2.5 emissions are as opposed to another boiler's emissions?

A. When looking at boiler emissions or

emissions from any source, typically I go to the vendors of those devices to get the information as to what the up-the-stack components of what is being emitted there are for a certain fuel. So in other words, to do an appropriate BACT analysis, I have to know the intimate details of, in this case a boiler, and the source of the boiler, and I have to know the fuels involved.

And of course, most of the time you get from the vendor, or all of the time you have to get from the vendor your particle size, what's emitted, and they do this by mass balance, by a test that they've done over the years. And I'm just going back typically to working on some of these other -- and I haven't done it on any boilers, but on the few boiler BACT analyses that I have done, I've always gone to the vendor. And then when I was at Riley, that's where we got all our information on sizing our particulate control device and our sulphur dioxide control device.

Q. So you heard Mr. Reich say in his opening statements today that there is no way to know what a particular source is emitting in the way of PM2.5 emissions because there aren't measurements for that; is that your experience?

A. No. I've been given very explicit discharge information from all of the boiler equipment I've worked on.

Q. Would you regularly expect a boiler vendor to know what categories of particulate matter that it was going to emit?

A. Yes, I would, unless it was absolutely a brand new device.

Q. By brand new, what do you mean?

A. One that has never been piloted or a full sized installation done before.

Q. So for a boiler that has been installed somewhere else, would you expect the boiler maker to know in detail what the size range of its particulate matter emissions would be?

A. Yes, I would. And obviously depending on where they install it, there can be different fuels and the like. But what we used to do at Riley, when we had a question on that, is we would do a full scale pilot test on our boiler to find out exactly what it was emitting.

Q. If I asked you to call a boiler maker today and ask Riley, for instance, and ask them, "What's coming out of our boiler in terms of PM2.5 emissions?," would they be able to give you an

answer?

A. Once I specified, again, my size, my fuels, and that type of thing, I think they could give me an answer. It's going to be a worst case answer, but when you're doing your BACT analysis, that's what you want.

Q. So at the first step, you would be considering the source itself. Once you got information from various vendors, then what would you do?

A. Well, then I'd look at the -- Again, looking at PM2.5, and PM in general for that matter, I would look at what my emissions are, my characteristics of my emissions, and then I would start to select control devices to handle those emissions. And again, looking at the BACT analysis top down, I would just start to select those, without getting into too much detail, just by knowing their emission efficiencies, and then start to further size them and the like, in order to put together my economic analysis.

Q. So at that stage where you're identifying the potential technologies, applying that in this instance, what technologies would you identify for control of PM2.5 emissions?

A. Well, right away on the top end would be the wet electrostatic precipitator, as well as a membrane bag bag filter. Just right off the top of my head, those would be the first two I'd select to look at. And then moving down from there would be bags of other materials for the fabric filter; dry electrostatic precipitators; I'm sure a scrubber would be kicked out, but you should look at it. It might be a combination then of dry filtration and wet ESP, dry ESP, FGD, wet FGD. There is a lot of combinations you can look at for any boiler. They all have an impact on PM2.5.

MR. MARBLE: Could you repeat the number one choice.

THE WITNESS: My first choice for PM2.5 would be -- on the electrostatic precipitator side would be a wet ESP, a wet electrostatic precipitator. Then on the fabric filter would be a fabric filter using a membrane bag.

Q. (By Ms. Dillen) And so just to clarify, you've mentioned the wet ESP alone, the fabric filter alone, and then you've mentioned that there were combinations. Could you explain what your number one combination would be.

A. Well, the number one combination would be a membrane bag filter and then followed by the wet ESP.

Q. What would be the advantage of that combination?

A. Well, the membrane bag filter would filter out the finest particulate down to around half a micron in size; and then the wet ESP would further filter the filterable particulate; and then it would also attack the condensibles that were being emitted by the boiler.

Q. Why would you consider a wet ESP all by itself?

A. The wet ESP does both. It collects the fine particulate, the filterable particulate, as well as the condensible particulate.

Q. How would you go on to figure out the control efficiencies for all these different controls and combinations of controls?

A. Well, typically what I do is you set up a matrix, and you look at your fractional efficiencies of various particles, let's say, going through the membrane bag filter or coming through the wet ESP. Then you just establish the amount removed in each, and then you establish the

further amount removed in each.

Q. And how would you know how effective each of these controls are at getting at PM2.5?

A. Well, besides published literature, working with the vendors of this type of equipment, and looking at what they indicate they can achieve.

Q. Is there a fair amount of literature about all of these technologies that we've talked about today?

A. Yes. Membrane bag filtration, there is quite a bit of literature. Wet ESP, there is literature, but again, it's vendor related, so that's when you have to get the vendors involved, because there is many configurations of wet ESP's.

Q. So do you think there would be enough information for you to have a fairly accurate idea of what each of these control technologies could do to reduce emissions of PM2.5?

A. Yes.

Q. So once you had identified the technologies, and you'd figured out how good they'd be at controlling PM2.5, what would you do next?

A. Well, then I have to look more at the

specific factors of the installation that it's going on. In other words, are there various restrictions, looking at the wet ESP; do I have restrictions in disposal of the wet waste; do I have to get my waters back in order to reuse it for the facility; what problems am I going to have in disposing of that water.

That all relates to what problems I may have in material selection for a wet ESP. In other words, am I going to have corrosion issues because of restrictions that are placed on me because of other site specific issues. Not knowing the site or whatever, do I have size issues; do I have a big green field area that I can do anything I want, or do I have to fit it in a shoe box. Those types of things all come into play.

Q. Is there any consideration that would be different or more difficult because you were looking at PM2.5 as opposed to larger particles, say, PM10?

A. No. I just think you have to take more care in looking at your condensibles, just to make sure you have them fairly well defined, and make sure that they're kind of worst case. I've had a

couple of instances where I had to do a material balance on the combustion source, and it didn't match what I was getting from the vendor, and that led to further discussions with the vendor, and we corrected the issue.

Q. Looking at this, is there any worry that you would have that would make it very difficult to rank various technologies, and figure out how they would be effective?

A. No, I really don't.

Q. Have you ever had occasion -- We know that no one has done a specific PM2.5 analysis to date. But in your analyses for particulate matter of larger sizes, have you ever had a situation where you had to figure out a technology that would work best for fine particulate matter of PM2.5?

A. Well, they didn't call it PM2.5 when I was doing it, but yes, in metallurgical applications.

Q. Can you just tell us a bit about that so we can understand how it relates to PM2.5 in the coal fired power plant context.

A. Well, bear with me, because this was pre-wet electrostatic precipitator day. But we

went ahead and had to evaluate the emissions coming from the metallurgical source, in this case it was a blast furnace, and determined the exact particle size in order to properly size. In this case, it was a two stage wet scrubber device. And I'm not going to get into the details of the wet scrubber, but two stages were required in order to reduce the energy requirements of this device. The single stage would have been almost one and a half times the energy.

So we characterize those particle sizes, and we had to put in a pre-quench in order to nucleate some of the condensible, or what we termed condensible fine particulates, in order to capture.

Q. I guess what I'm wondering, is controlling condensible and filterable PM2.5 a new problem?

A. No, not really. For the most part, most people don't try to control the condensible portion unless it causes a different problem, and that problem would be something like, let's say, a plume, a visible plume, like an acid plume or something like that.

Q. So are there occasions when facilities

have needed, for various reasons -- maybe a plume -- to control their PM2.5?

A. Yes. As a matter of fact, some power plants have gone ahead and done that.

Q. Can you explain to me what power plants those were.

A. I think it was Excel Sherkel (phonetic) facility, and AES, and I think there is a Canadian facility, New Brunswick as well. And those were all to attack not only condensibles, but they get filterable particulate as well, and they just installed wet ESP's to do that. And for the most part, it was an acid plume problem. It was attributable to H2SO4, sulphuric acid mist.

Q. So did those facilities install a wet ESP to address condensible particulate issue?

A. Yes.

Q. You may have also heard Counsel for the Department and SME today say that their analysis for PM10 really covered the bases for PM2.5. Do you agree with that?

A. Well, I don't agree, just because by virtue of the fact, at least from what I saw in the permit and the like, that they did not consider the filter bag we discussed or the wet

ESP.

Q. Would it make a difference to do an analysis that was specifically targeted at PM2.5 rather than PM10, in your opinion?

A. Well, it will, once you select those items, yes.

Q. Can you elaborate.

A. Well, you're doing a much finer -- you're filtering out finer particulate with a membrane bag, and you're removing condensibles and also fine particulates with the wet ESP.

Q. I want to take you back for just a moment to what we know about the Highwood coal plant's expected emissions of PM. Are you aware whether their emissions inventory has any estimates of their PM10 emissions?

A. Yes. They do have it listed on a chart, yes.

Q. Does that figure regarding the estimated PM10 emissions give you any idea of what the PM2.5 emissions are likely to be?

A. Well, without knowing the specific emission limit that they sized the baghouse for, it's hard to say, but I would say most of it is PM2.5.

Q. Why would you say that?
A. Because that's the particulate they're going to miss with the control devices selected.
Q. Why do you think they're going to be missing the PM2.5?
A. Well, because the majority of the material coming from the -- passing through the filters is going to be the fine particulate. It may be PM2, or PM 1.75, but it's going to be a fine particulate.
Q. So if you have a high control efficiency for PM10, what kind of emissions are you going to have less that are slipping through the cracks?
A. PM2.5 and smaller.
Q. In general, is it your opinion that condensible emissions are made up of particulate matter in the 2.5 size range?
A. Yes, and smaller. It's smaller than 2.5.
Q. Based on our discussion today, is it your opinion that technologies are available and commercially available?
MR. REICH: Objection. Could Counsel please ask the question in the proper way. She's basically giving him the answer before he's given

a chance to respond.

Q. (By Ms. Dillen) Mr. Taylor, could you give your opinion as to the practicability of doing a PM2.5 BACT analysis for a coal fired boiler, including the CFB boiler we have at issue in this case?

A. I think it could be done.

Q. Could you explain why.

A. Because there is equipment available to control PM2.5, both filterable and condensible.

Q. And are you aware of what the control efficiencies for those various equipments would be?

A. Well, they're very high, but it depends upon what the fraction of the particulate is below the cut limits on those. So in other words, for the bag filter, how much particulate is below .5 microns.

Q. Could you find that out if you identified technologies and then wanted to know how efficient they were?

A. Yes.

Q. Is there any other impediment that you see to conducting the BACT analysis for PM2.5?

A. No.

MS. DILLEN: I have no further questions on direct.

MR. REICH: Mr. Russell, with the permission of the Board, I would like to go first before Mr. Rusoff.

MR. RUSOFF: I have no objection.

MR. REICH: Can I just take two minutes just to consult.

CHAIRMAN RUSSELL: That's fine.

(Off the record briefly)

CROSS-EXAMINATION

BY MR. REICH:

Q. Good afternoon, Mr. Taylor.

A. Good afternoon.

Q. Good to see you again.

A. Good seeing you.

Q. Mr. Taylor, it's true you don't have an advanced degree, only your bachelors; is that right?

A. That is correct. I do not.

Q. I think you testified in your deposition you're not an expert in BACT regulatory requirements; am I correct?

A. That is correct.

Q. And isn't it true that you've never done a complete BACT analysis before, that is, Steps 1 through 5?

A. I have done Steps 1 through -- I've done the -- I've looked at specific operating costs for the equipment. What I have not done is made the -- I've put what I would select as BACT on my work to the client, but I never did the final selection, because I did not know the cut limit for the dollars per ton that would be acceptable as economically feasible.

Q. It's fair to say you've never done an analysis in which you actually came up with an emissions limit for the particular unit; is that correct?

A. No. I've only given the limit that the BACT analysis showed that the equipment could do. That is correct.

Q. So when you've done those BACT analyses, you've worked with environmental consultant and other folks with that kind of experience, have you not?

A. Typically people within the organization of the company that I was working for, be it the paper company, whatever industry it happened to

be.

Q. And you were brought in primarily to advise on technology; is that correct?

A. That is correct. My experience.

Q. Is it fair to say you've never done a BACT analysis for PM2.5?

A. That's fair to say, yes.

Q. Isn't it true that you testified in your deposition that you've never advised a client to perform a BACT analysis for PM2.5 specifically?

A. That is correct.

Q. Mr. Taylor, you mentioned that you owned a company. I forgot the name actually.

A. Advanced Air Technology.

Q. When did you sell that company?

A. 1990, 1989.

Q. Do you have any further relationship to that company?

A. No, I do not.

Q. Do you receive any compensation from that company?

A. No, I do not.

Q. Do you have any relationship, financial or otherwise, with any other pollution control vendor?

A. No, I do not.
Q. Or any pollution control manufacturer?
A. No.
Q. Do you have any relationship with any manufacturer of membrane filters?
A. No, I do not.
Q. Vendor of membrane filters?
A. No.
Q. What about wet ESP?
A. No.
Q. You prepared a report in this case; is that correct?
A. With the assistance of another individual, yes.
Q. Who that was individual?
A. It was Mr. Scott Evans.
Q. And is Mr. Scott Evans a named expert in this case, as far as you know?
A. No.
Q. Did that report have Mr. Scott Evans' name on it?
A. No, it did not.
Q. Is true that Mr. Scott Evans prepared approximately one half of that report?
A. That is correct.

Q. You've testified about various technologies today, and you've also indicated that you've looked at the permit in this case, correct?

A. Correct.

Q. Isn't it true that both SME through its applications and DEQ through its permit analysis analyzed the wet and dry ESP as part of the filterable analysis?

A. I don't recall the wet ESP as far as the dry filterable. I thought it was just listed as ESP.

Q. They did look at ESP; is that correct?

A. Yes, they did.

Q. At a break, I'll see if I can locate the page that talks about wet ESP, and we can look at that. And didn't DEQ find that -- for filterable emissions, didn't DEQ find that the fabric filter was more efficient than the ESP in that case?

A. Yes, but again, I thought it was dry ESP.

Q. Didn't the analysis also note that with an ESP, you don't get the same co-benefits of controlling S2 that you get with a fabric filter?

A. Yes, it did indicate that for the ESP. Again, I think it's a dry ESP.

Q. We'll check that in a second. In a condensible analysis --

MR. REICH: And for the Board, this is Exhibit 7. This is the permit itself, and it's in the permit analysis sections, which are essentially 27 to 40, 27, in that range is the permit analysis, is the analysis of filterable PM; and around Page 40 of permit analysis is the analysis of condensibles.

Q. (By Mr. Reich) Mr. Taylor, are you familiar with the condensible analysis in the permit for Highwood Generating Station?

A. As far as the one --

MS. DILLEN: Objection. Can the witness have the document you're referring to?

Q. (By Mr. Reich) It's right in that book. If you would look at Tab 7.

MS. DILLEN: Does Mr. Taylor have the pages that were omitted?

MR. REICH: I don't know. Do we have the extra pages?

I understand that in producing 15 copies of this large notebook that a couple of pages of the permit itself got a little mixed up. So that if you go to page -- at least in my book, if you

go to Page 26 -- but I think some of the pages might have been mixed up or missing.

MS. BREWER: They're all there. They're just out of order.

MS. DILLEN: I'm not sure. Is it Exhibit No. 7?

MR. REICH: Seven.

MS. DILLEN: This is the entire permit. If you don't have any objection, I can help him find it.

MR. REICH: Page 40 of the permit analysis.

Q. (By Mr. Reich) Mr. Taylor, I'm directing you to Page 40 of the permit analysis of Exhibit 7 in the joint exhibits. Do you see that in front of you?

A. Yes, I do.

Q. Do you see a table at the bottom of Page 40?

A. Yes, I do.

Q. And what is that table?

A. That is a table summarizing the available control options, the respective potential control efficiency values, and their ranking for the BACT.

Q. Mr. Taylor, so that's the ranking of technologies?

A. That's what it indicates, yes.

Q. And do you see wet ESP ranked on that list?

A. Yes, I do.

Q. Where is it ranked?

A. I see No. 2 is wet FGD and wet ESP.

Q. And the wet ESP, is that the same wet ESP you were testifying to earlier?

A. I take it as such, yes.

Q. So in fact SME and DEQ did analyze a wet ESP control for PM condensibles; is that correct?

A. For condensibles, yes.

Q. You've already testified that condensibles are primarily made up of PM2.5?

A. That is correct.

Q. So is it fair to say that the DEQ and SME in the permit analyzed for condensible PM2.5?

A. Well, again, it was wet FGD and wet ESP. Is that not a combined? You have to bear with me. My memory on this one is -- We looked at combined sources, because I think once we looked at this before, and we were talking about what about dry FGD and wet ESP combination. In other words, we

are looking at combinations here, are we not?

Q. Yes.

A. And I was saying you have dry FGD and fabric filter baghouse or ESP. Why not dry FGD and FFB, or ESP, or wet ESP?

Q. But you see there that wet ESP was evaluated as the final exit, as it were, from the stack control of condensibles; is that correct?

A. Correct.

Q. You mentioned another type of technology, membrane filters, correct?

A. That's correct.

Q. Is it true that you've never worked on a power plant application in which a membrane bag was used for PM control?

A. That is correct.

Q. Isn't it true that the examples that you gave in your deposition and testified to today regarding membrane usage are not at utility scale power plants, but they were industrial power plants used to provide heat and electric for those industrial facilities?

A. That's correct, but they were 100 megawatt size.

Q. But these were not utilities; am I

right?

A. No, they were not owned by utility industry.

Q. Are you aware of the Ottertail study by the Department of Energy?

A. I'm familiar with the study by name only.

Q. That was a study of membrane filters in use at the Ottertail facility, which is a utility in South Dakota; is that correct? Perhaps it's North Dakota.

A. Yes. It's one of the Dakotas.

Q. Have you read that report?

A. No, I have not.

Q. Are you familiar with the conclusions in that report?

A. No, I'm not.

Q. Are you aware that in this DOE financed study, which is dated February 2007 --

MS. DILLEN: Objection. You're testifying as to facts that are not in evidence, and the witness has not reviewed this report. It's not an exhibit before the Board. No one has seen it.

MR. REICH: I think on

cross-examination, I'm entitled to ask him whether he's aware of the conclusions.

THE WITNESS: No, I haven't seen the study.

CHAIRMAN RUSSELL: Restate your objection.

MS. DILLEN: My objection is that we are -- that Mr. Reich is effectively testifying as to matters that are not in evidence. The Board does not have access to this report. No one has seen it. My expert has not reviewed it. I have not reviewed it. It's not an exhibit in this case.

MR. REICH: I'm not planning to introduce it. This is for impeachment purposes.

CHAIRMAN RUSSELL: What are you using it for then?

MR. REICH: Just to show -- I'll just make a proffer to show that the report indicates that this membrane technology did not work under a DOE grant at a major power facility.

MS. SHROPSHIRE: Does that mean that we can introduce other DOE reports that haven't been presented at this time also?

MR. REICH: Perhaps that's addressed to Ms. Orr, I would assume.

MR. MARBLE: I move we sustain the objection.

MS. ORR: Mr. Chairman, members of the Board, this is a situation where the foundation has been that the witness hasn't read the information, so I think it would be improper to draw out more information and present it as evidence to the Board when the witness is unfamiliar with it.

MR. REICH: That's fine. We can address it through our witnesses. That's fine.

Q. (By Mr. Reich) Mr. Taylor, isn't it true that membrane filter bags are not sufficiently reliable that they would survive a BACT analysis for a power plant for use of technology to control PM2.5?

A. I have no indication whatsoever that that is the case.

Q. You testified about a combination of a fabric filter and a wet ESP, correct?

A. Yes.

Q. And isn't it true that you have never worked on a commercial utility application in which such combination was used to control PM2.5?

A. That's correct.

Q. And to the best of your knowledge, isn't it also true that that combination of a fabric filter followed by a wet ESP has not been used by any commercial utility for control of PM2.5?

A. I don't know of any. You're correct.

Q. Are you familiar with the Deserit permit?

A. I have glanced through the permit, yes.

Q. Are you aware that in that case, the Deserit permit -- withdraw that question. Do you know when that permit was issued?

A. It's recently, I believe, is it not?

Q. Is it more recent than the DEQ permit in this case?

A. I don't recall.

MR. REICH: Just for the Board's information, it is one of the exhibits in the joint exhibit package.

Q. (By Mr. Reich) With respect to the Deserit permit, are you aware that EPA evaluated the use of a fabric filter followed by a wet ESP?

A. Yes, I'm aware of that.

Q. Are you aware that in EPA's analysis, they stated, quote unquote, "That kind of a combination is economically prohibitive"?

A. For that particular installation, I saw that, yes.

Q. And do you know whether the Deserit permit was a CFB boiler?

A. No, I don't recall.

Q. If you consult with the exhibit, would you be able to determine that?

A. Sure.

MS. DILLEN: That's the exhibit number?

MR. REICH: That's what I'm trying to figure out.

Q. (By Mr. Reich) I think it's No. 11, 12, and 13 of the various components. No. 11 is the permit, No. 12 is the statement of basis, No. 13 is the response to comments. If you could just go to No. 11 and just --

A. According to this, it is a CFB boiler.

Q. Is the Highwood Generating Station proposed plant a CFB boiler?

A. Yes, it is.

Q. Also in reference to the Deserit permit, are you aware that EPA, in issuing that permit, used PM10 as a surrogate for PM2.5?

A. Yes, I'm aware of that.

Q. Are you aware of some of the problems

that EPA identified with respect to a wet ESP?

A. No. I did not read this in detail.

Q. Is it true that one of the problems with a wet ESP is that it has to use a lot of water?

A. Yes. I alluded to that when you were discussing this earlier.

Q. Is it also true that a problem with a wet ESP is that you have to dispose of wet waste streams?

A. Yes. That's another issue.

Q. Is it also true that a wet ESP can create ozone and other criteria pollutant?

A. Well, it depends on the wet ESP, but in some, they can, yes.

Q. Would you agree that because of the temperature drop of gases going through a wet ESP, that -- Are you aware that because of the temperature drop of gases going into wet ESP, that the temperature of the exhaust exiting the wet ESP needs to be increased?

A. In some applications, it does, yes.

Q. And if the temperature has to be increased, does that take some energy to do that?

A. Yes, it does.

Q. And that takes some extra cost to do

that?

A. Yes, it does.

Q. And if the temperature were not increased, would that result in less heat going to the steam generator?

A. Yes.

Q. Which could lead -- and that could lead to loss of efficiency of the boiler; is that true?

A. Correct.

Q. I think we've covered this. I just wanted to make sure. Does a fabric filter get a co-benefit of SO2 control?

A. Yes, it does.

Q. Would you agree that a wet ESP does not get that same benefit?

A. No. Depending on how the wet ESP is operated, it has been shown to get some S02 benefit.

Q. But not as much as the --

A. Not as much as the fabric filter.

Q. Returning again for a second to the Deserit permit, isn't it true that in Deserit, EPA did not identify a teflon coated fabric filter as a technology?

A. I'm not aware of that. I'm not that

familiar with it to know that.

Q. Is it possible to look at the Deserit permit?

A. Can you indicate where that is in here?

Q. I think it would be in the permit analysis. Look at Page 60 of the permit analysis, which is Exhibit 12.

A. (Complies)

Q. Exhibit 12, Page 60.

A. Yes, I'm reviewing it now. (Examines document) Yes. They were just discussing a standard bag of some sort.

Q. And unlike the Deserit permit, the DEQ in this case with the Highwood permit actually identified two types of fabric filters as control technologies; isn't that true?

A. Yes, that is true.

Q. What were those technologies?

A. One as I recall was a fiberglass bag, and the other one was a teflon coated bag, which I assume is fiberglass, teflon coated.

Q. Does a teflon coated bag have a higher efficiency than the straight fabric filter?

A. No. The reason for the coating -- Again, I'm making the distinction, because we

chatted about this in my deposition. There is a distinction between the teflon coated bag and the membrane bag, and I'm making the assumption -- and we never -- kind of came to the conclusion at my deposition that the teflon coated bag was not a membrane bag.

All fiberglass bags have to have some type of coating on it to act as a lubricant for the threads. If they don't, and you just have a dry fiberglass bag, it's going to fail in service very rapidly. So typically there is some type of coating on that bag, and one of the typical coatings is a teflon. The other you read about is what they call an acid resistant coating, which is usually a little bit of teflon with some silicon and the like. But again, it's a thread lubricant rather than an answer for filtration.

Q. Let me call your attention to Joint Exhibit 4, which is the permit application or selected pages thereof. Go to Page 5-23.

A. (Complies) Yes, I am on that page.

Q. Does that page not rank, in the table at the bottom of 5-23, doesn't it rank the different types of bags plus other equipment?

A. Yes, it does.

Q. It lists the teflon coated bag as having higher efficiency than the straight fiberglass bag, does it not?

A. Yes, it does. I don't know why. And I doubt if it's a straight fiberglass bag as well.

Q. But that's what the permit application says?

A. I understand that, but that's something that just wouldn't work in practice.

Q. Mr. Taylor, I believe in your deposition, I asked you whether in consulting the RACT/BACT/LAER Clearinghouse -- RBLC -- for various technologies, in reference to your deposition, that you did not locate a membrane filter bag as a technology for PM; is that correct?

A. That is correct.

Q. Is the RACT/BACT/LAER Clearinghouse one of the sources that a person like you would go to in trying to figure out appropriate technology in a BACT analysis?

A. Certainly, but as part of a BACT analysis, there are many other sources to go to as well.

Q. Mr. Taylor, would you agree that the use

of a surrogate analysis tends to over-count PM2.5 emissions since they are a subset of PM10 emissions?

A. It may or may not. I'm not 100 percent sure.

Q. Would you agree that PM2.5 emissions are a subset of PM10?

A. Yes, they were a subset, definitely.

Q. So if you count all PM2.5 emissions as if they were PM10 emissions, don't you over-count the PM2.5 emissions?

A. So what you're saying is that if all emissions you were looking at were PM2.5 included in the weight of ten, you would certainly be over-counting.

Q. And that's what was done in this case; is that correct?

A. Well, I don't really know if that's what was done.

Q. Was a surrogate analysis done?

A. A surrogate analysis was done, but if you were looking at -- I don't know what particle size information is given to do the analysis.

Q. Aren't you aware that DEQ ratified a surrogate analysis using PM10 as a surrogate?

A. Yes.
Q. So wouldn't that over-count PM2.5?
A. I don't think I can draw that conclusion. I'd have to look at that.
Q. In your deposition, didn't you agree with me that that would over-count?
A. Yes, but it's being presented and worded differently here than -- I think I'm confused.
Q. In your report you stated, "Emissions limitations for filterable PM10 in the Highwood permit are not a valid surrogate for BACT determined PM2.5 limits." EPA guidance allows that kind of surrogate analysis, does it not?
A. Yes, it does.
MS. DILLEN: Objection. This is beyond the scope of what the witness has been offered to testify to.
MR. REICH: He's testified about the deficiencies with the surrogate analysis, so I think it's important to ask him whether he thinks it's valid or invalid.
CHAIRMAN RUSSELL: We'll allow it.
Q. (By Mr. Reich) Mr. Taylor, we've already established that SME and DEQ conducted -- or SME conducted and DEQ reviewed a PM2.5

surrogate analysis of using PM10?

A. Yes.

Q. Mr. Taylor, let's go back to the permit in this case, which is at Tab 7. We had talked about the types of control options, and I believe you were questioning about ESP and whether it was dry or wet.

A. That is correct, yes.

Q. Could you look at the summary table at the top of Page 25.

A. (Complies)

Q. 25 of the permit analysis.

A. Yes, I have it.

Q. And when you testified earlier, you said you weren't sure whether what was being analyzed was a wet or a dry ESP, correct?

A. That is correct.

Q. Looking at the table at the top of Page 25, doesn't that indicate that both wet and dry ESP's were analyzed in the BACT analysis for filterable PM?

A. Yes, it did, and I didn't see it priced, or I didn't see a cost analysis. That was one of the reasons this came up during my deposition, I believe.

Q. But it was analyzed as one of the available control options, correct?

A. Yes, it was.

MR. REICH: No further questions.

CROSS-EXAMINATION

BY MR. RUSOFF:

Q. Mr. Taylor, I just have a few additional questions. I believe you just testified that in performing a BACT analysis, a person would certainly consult the RACT/BACT/LAER Clearinghouse, among other sources; is that correct?

A. That's correct.

Q. Do you remember -- again referring you back to your deposition. Do you remember testifying that you've never used EPA's RACT/BACT/LAER Clearinghouse?

A. I personally have not, no.

Q. But yet that's something that you said a person would certainly consult in completing a BACT analysis; isn't that correct?

A. Yes. I have a couple of assistants that helped me with that.

Q. Mr. Taylor, when you formed your

opinions in this case for the Petitioners, you weren't aware of EPA's Deserit permit, were you?

A. No, I was not.

Q. I'll try not to ask any questions that Mr. Reich already asked you. If I do, I apologize. But do you recall from -- and feel free to refer to it if you need to. But do you recall the analyzed control efficiency of the fabric filter baghouse that the Department determined to constitute BACT for the Highwood Generating Station?

A. Yes. I recall the emission limits, yes.

Q. Do you recall what the control efficiencies was for the baghouse?

A. I believe it was .012 pounds per million Btu.

Q. I was asking the control efficiency percentage.

A. I'm sorry. No. That I don't recall. But it was 99.6, 99.8, something like that.

Q. If I told you that it was 99.85 percent, does that sound correct?

A. That sounds correct.

Q. And isn't it correct that you don't know that a membrane bag baghouse would have a greater

control efficiency than 99.85 percent?

A. Not without doing the analysis you do through a BACT, no.

Q. But as you sit here today, you can't state that, can you?

A. No, I can't. I can just say it's a more effective control device.

MR. RUSOFF: I don't have any further questions. Thank you.

REDIRECT EXAMINATION

BY MS. DILLEN:

Q. Mr. Taylor, are you aware that a surrogate analysis for PM2.5 involves both modeling to demonstrate compliance with the National Ambient Air Quality Standards as well as doing a BACT analysis?

A. Yes, I am aware that there's modeling.

Q. Do you recall at your deposition if the discussion about surrogates involved modeling?

A. I don't recall.

Q. Perhaps we can refresh your memory, but just to clarify a few points in advance of that. When you were thinking about demonstrating compliance with the NAAQS, and you're modeling, at

that point, would using PM10 as a surrogate for PM2.5 be conservative?

MR. REICH: Objection. I don't think he's been qualified as a modeling expert.

Q. (By Ms. Dillen) Mr. Taylor, in what aspect -- I think I'd like to refer you back to your deposition testimony.

MS. DILLEN: I'm referring to Page 98 of Mr. Taylor's deposition. I'm handing Mr. Taylor Pages 98 through 103 of his deposition. (Provides document)

Q. (By Ms. Dillen) Just take a moment to review those pages.

A. (Examines document)

Q. Mr. Taylor, have you had a chance to review your deposition testimony from November 9, 2007?

A. Yes.

Q. Would you like to clarify what the discussion about the PM10 surrogate analysis, and whether it's conservative, was all about?

A. Yes. We discussed the filterable particulate as well as modeling. And the modeling end, we indicated that they modeled it all as PM2.5, and I agree that that certainly is

conservative, but I am not a modeling expert, so I don't know exactly what that means. But transport-wise, it would go a lot farther.

As far as the filterable, I still come back to have some confusion from that, just as in from reviewing my deposition, we were almost going down the same path we went a couple months ago, but I wasn't aware of it until I saw it.

So PM10 and PM2.5 aren't really the same when you're looking at filterable particulate. It depends on the source. That's basically what I indicated then.

Q. If you want to capture PM2.5 emissions, if that's your goal, would it be conservative to focus on capturing PM10 emissions?

A. No, I don't find that to be conservative at all. It would be the other way around. If you were going to be conservative on capturing PM10, you would go after PM2.5.

Q. So if a surrogate analysis is focused on capturing PM10, will that be conservative in terms of capturing PM2.5?

A. No. The basic technology needed to capture 10 versus 2.5 is totally different. It's a different phenomena, it's a different -- just as

I was talking about the particle size, and the magic number three microns, so --

Q. Discussing the issue of whether this wet ESP was considered, were you able to review the cost per ton comparison that was done during the permitting process for the Highwood Generating Station permit?

A. Well, I reviewed it, but I did not see -- maybe I did not see all of it, but I did not see an evaluation of a wet ESP. I saw what I deemed to be a dry ESP because it just said ESP.

Q. In the analysis that you saw in the permit application that was actually looking at costs per ton for each of these control efficiencies, when you looked at that, did you see any reference to how a wet ESP would price out?

A. No, I did not.

Q. And referring you back to, I believe it was Exhibit 7, the permit analysis, back to Page 40. Mr. Reich had directed you to a table that mentioned a wet ESP in combination with a wet scrubber FGD.

A. Yes.

Q. Is it your opinion that a wet ESP in combination with a dry scrubber might have

different control efficiencies than a wet ESP in combination with a wet scrubber?

A. Yes. That was one of the points I brought out in my deposition, I believe.

Q. Why would that be?

A. Well, we're just looking at a wet ESP as having a higher collection efficiency for particulate.

Q. And do dry FGD's have a higher efficiency than wet FGD's?

A. Wet FGD, it depends on the FGD. But typically you can get much higher emission control with a wet FGD.

Q. Do you see any indication here that a scrubber and fabric filter were ever considered in combination with a wet ESP?

A. You mean a dry? We wouldn't want to have a -- Well, if we have something wet, it should go after the fabric filter, so -- I'm just looking at these combinations. We have a dry FGD, plus a fabric filter baghouse, or an ESP -- I'm assuming that to be dry -- and then we have in another line a wet FGD and a wet ESP all by itself; and then we have a wet FGD. So we don't have the other combinations that we've been

talking about.

Q. In your review of the permit application, did you ever see any cost analysis that would help to rank the wet FGD and wet ESP combination?

A. No, I do not see those.

Q. And any particular control efficiencies in tons per year that that --

A. No. I did not see that portion of the BACT if it was available.

Q. Is there anywhere with respect to condensibles that you see the combination that you've discussed here today of a fabric filter followed by a wet ESP?

A. No, I do not.

Q. With respect to the option of following a fabric filter device with a wet ESP, Mr. Reich referred you to the Deserit permit where EPA decided not to identify that option as BACT. Are there any reasons why the analysis of this combination of control devices would be different in the context of the Highwood Generating Station?

A. Well, there may or may not. Again, BACT analyses are very site specific. And so with respect to the wet ESP, it depends on whose wet

ESP, how they sized it, did they have four fields. What were they going after? You can have a number of fields and get more and more efficient, but you can also gain some efficiency by just making a small one. So I don't know. I'm not privy to the design or the analysis of that particular BACT analysis.

Also I don't know the differences between the sites. Water issues are certainly problematic with any wet device that removes pollutants. So if they have a disposal issue there, some costs involved with that, water problems, pondage on site that you can't use, do I have to recycle the water. Who knows?

So there is all specific reasons that things can cost more or less, and so that's why I think the -- When I look at a BACT, it's very site specific. And I believe actually the BACT NSR Handbook tells you not to necessarily look at other BACT analyses to draw a final conclusion. They want you to draw it on each individual specific site.

Q. Can you reject a certain technology as not being BACT based on a permit analysis that was done somewhere else?

A. I suppose if it was identical, but I wouldn't. I'd want to run through the analysis. It should be on the basis of the BACT analysis. That's what the BACT is for.

Q. Mr. Taylor, if I can refer you back to the Joint Exhibit No. 4 at Page 5-23. In your opinion, what does this table indicate about the efficiency of the teflon coated bags versus the fiberglass bags?

A. Here it indicates them as being more efficient.

Q. Are there any bags that would be more efficient still than teflon coated bags?

A. Well, the membrane bag we have been discussing.

Q. In your experience with membrane bags, you indicated that the projects had not been owned by the utility industry. Was there any other significant difference between those projects and how a membrane bag might be used at a coal fired power plant that was owned by a utility?

A. Not really in the context of my experience. In actuality, I feel the application was more difficult because it was on an older fluidized bed boiler, and the retrofit had some

inherent physical designs with the fabric filter housing that really couldn't be changed for the change-out of the bags. So it wasn't a new installation, and it really wasn't ideal as far as what you would have as a design, fresh design.

Q. Changing topics. You were questioned about the co-benefits that a fabric filter has in terms of controlling sulphur -- or desulphurization. I'm sorry. Are there any co-benefits that you might see if you employed a wet ESP?

A. Well, the wet ESP will remove condensible particulate.

Q. So if you were using a wet ESP at the filterable stage, what might the upsides be?

A. You would get some of the condensibles.

Q. Mr. Reich also asked you about some of the limitations of a wet ESP, and where it works well and where it might not. Do these characteristics depend on a specific facility?

A. Only from the -- As far as operation or as far as the cost of the equipment? Operationally it shouldn't make any difference.

Q. Why is that? Could you repeat your answer to that first?

A. Well, operationally, the wet ESP pretty much just depends upon the particulate coming into it and its volume, and your charging rates and other things that you have on ESP.

Q. Is there any particular reason why an ESP would create problems in connection with a coal fired boiler, that you're aware of?

A. Well, one of the problems that was alluded to, it does cool a stack just like a scrubber does. Those considerations have to be taken into account when you're doing your BACT analysis for sure.

Q. Would there by any upsides that would compensate for that down side?

A. When you're looking at particulate collection.

Q. So would that just be one consideration that would go into a BACT analysis, ranking technologies?

A. Yes. Those are the things you have to look at, as far as looking at the total picture. As far as the costs go and the equipment, you can't just look at the emission control equipment alone. You have to look at everything, from things as simple as the foundations, all the way

through the duct work, stack; coatings that are in the stack, because it's not dry stack anymore, it's wet. You've got corrosion issues. All those come into play.

Q. We've talked a lot today about the different kinds of considerations that you would make in evaluating these various control technologies, and you've told the Board a lot of those considerations. In your opinion, were those sorts of considerations part of the permitting process that you've had an opportunity to review?

A. Some of the equipment, yes. As far as the -- I think they looked at it that way for the fabric filter, and the teflon coated fabric filter, and the dry ESP, but I'm not aware of it on the other equipment that we've chatted about, or the other ones that were listed in the document.

Q. So what would you say, just in summary, the gaps in the analysis that you saw?

A. Well, I don't just think they did any -- It doesn't appear to me to be a complete top-down BACT.

Q. Why is that?

A. Because it's missing some of these high

efficiency items for the key combinations -- if you want to call that -- a combined unit. And the pricing. It's got it mentioned, but it doesn't have the economic analysis.

Q. And just one last question here, so we can be sure that the record is clear to the Board. What exactly do you think the technology is and the combination of technologies were that were not considered or adequately considered in the permit analysis?

A. Well, for the fabric filter, the membrane bag, to the best of my knowledge, was not considered; and the wet ESP, for the combination of fabric filter followed by another device, wasn't considered.

MS. DILLEN: Thank you. Would the Board like to ask any questions of Mr. Taylor? Otherwise we can conclude this.

CHAIRMAN RUSSELL: I believe we do have a few.

EXAMINATION

BY CHAIRMAN RUSSELL:

Q. On Page 525 of the permit, they talk about the annual operating cost for a teflon

coated bag being $500,000 more than the fiberglass bag. Why would that be?

A. Well, that was one of the -- I'm puzzled with that myself. So I don't know the specifics of that bag. Certainly if you look at costs of bags, a fiberglass bag, with some other coating other than teflon, is probably a lowest cost; then you ramp it up to like a 10 or 15 percent coated teflon bag, so that's probably another $10 or $20 a point, a bag.

And then the highest cost bag is the membrane bag, and that's about -- depending on the bag length, which we don't know, or the bag size -- but typically you can say it's about twice as costly as a teflon coated bag.

They must be anticipating a lot of failures or abrasion issues for the maintenance. I could see certainly in the capital onset.

Q. But you stated that teflon -- even a teflon coated bag is -- they do that so that they last longer, right?

A. Yes. So that the bag doesn't self-destruct, yes.

Q. So do they get this information from --

A. I don't know where they got their information, but typically you would get this from your fabric filter vendor.

Q. It's my understanding that the Department didn't do the BACT analysis. The BACT analysis was part of the application for a permit. It was reviewed, it was sent back -- from other documents I've seen, it was sent back; there was some discussions about different things. But there was a point that was brought up that it's really always going to be some other third party that submits a BACT analysis.

A. Uh-huh.

Q. As part of a permit.

A. Sure.

Q. Not a third party, so it could be --

A. But some other consultant or whatever it happens to be.

Q. So most of this information is probably -- just like you did it -- most of this information is taken right from the vendor, right?

A. Most of the time, yes. That one, that cost for the operating cost kind of puzzled me. But I'm not so sure what they're -- I'm not so sure the design of that piece of equipment, or why

they're going to see -- why they're planning on seeing these failures.

Typically your bag life, unless they're amortizing -- they might be amortizing -- This might be what they're doing, is amortizing the replacement of all of the bags over the "X" years the bags last. That must be what they're doing, because I can't think --

Q. When you do a BACT analysis, the paper that doesn't get submitted with the permit, times the amount of paper, what would that be?

A. Well, again, it depends. This one, I would imagine it would be a pretty thick volume.

Q. Twenty, thirty times every sheet we see?

A. I'd probably say at least twenty, if you're going to -- and there is a lot of dead ends in that, too, if you're going to vendors and the like. It just depends on how rigorous. A BACT analysis is like a plus or minus 20, 30 percent dollar range. When I get involved in them, the customers that I work with want to see it like within a 5 or 10 percent. So I'm doing a little more rigorously on the equipment selection than maybe they do for permitting, but I have more time typically than the guys that do it for the permit.

EXAMINATION

BY MS. KAISER:

Q. You mentioned once that you get information from the vendors. Is that for particulate control, or is that for like a boiler manufacturer that you actually -- you get emission estimates or both --

A. I get the emission estimates from the somebody who is making the flue gas generator, in this case, the boiler, yes.

Q. You said one time you had got unreliable information from a vendor, but you resolved it?

A. Yes.

Q. Is that --

A. You have to be watchful on these things, but --

Q. It's not always required?

A. If you do enough of these, or if you know enough about the emission source -- and I hate to call it that, but when we're on the receiving end, as we call it. You just start to see something that's an outlier, and you just question it.

MR. SKUNKCAP: Can we ask about mercury on this one?

CHAIRMAN RUSSELL: No, as much as we want to.

RE-EXAMINATION

BY MS. SHROPSHIRE:

Q. I'm just trying to get all these acronyms straight. We have the dry ESP and the wet ESP, and it's my understanding that the dry ESP doesn't control the condensible nearly as well as the wet ESP does.

A. That is correct. In general, yes.

Q. And then there is the dry FGD.

A. Yes.

Q. And the wet FGD.

A. Yes.

Q. Can you explain the difference between --

A. Typically -- as simple as dry FGD.

Q. Remind me what FGD is.

A. Flue gas desulphurization. The simplest dry FGD would be a fabric filter, like we talked about, the baghouse. And what you would do ahead of that baghouse, you would inject an absorbent like lime, crushed limestone, soda ash, something that could absorb sulphur dioxide. And then your

source that fed into that baghouse would combine with that particulate, and the reaction would take place in the dry phase.

And so what happens is when you clean the baghouse, then you'd get absorbed SO2 combined with your absorbent in the discharge.

Q. I'm more familiar with just the baghouse. Is an FGD in a baghouse, are those not synonyms, but sort of the same thing?

A. No. The flue gas desulphurization -- The baghouse is really primarily for particulate control. And I look at the sulphur dioxide removal in the baghouse as an enhancement control. So in other words, you primarily put the baghouse in to control particulate, but by using a reagent that's injected ahead of it, it can also do SO2 control and other acid gases.

Q. So that is an add-on to the baghouse?

A. Yes. In this case, I believe the -- and I don't know enough about this particular specific design of the power station. But here, the particulate coming out of the boiler has the dry absorbent in it already, because it's in the fluidized bed boiler, and that reaction takes place -- further takes place in the baghouse. In

other words, it needs some dwell time for reaction, and that's what takes place.

Now, wet FGD, on the other hand, is a wet process, where you mix your reagent with water. So you could mix crushed limestone, lime, soda ash, caustic soda, magnesium oxide. You can mix these with water, and then you scrub out the SO2 coming in in an absorber tower of some type, where you have sprays of this liquid with the reagent in it, commingling with the air passing through it. And you get a quicker reaction, and typically, your efficiencies on a wet FGD will be much higher than the dry, and it's just because you're reacting everything.

And as a matter of fact, your utilization is better, too. In other words, you don't have any reagent that is unused. In the dry FGD, you always have some reagent that hasn't been used up, whereas in the wet FGD, you can design such that you can pretty much get 100 percent usage.

Q. You mentioned that -- I don't know if this is the ideal situation -- but the situation that you think would likely work the best was in what order?

A. I was talking about the highest efficiency.

Q. It involved a wet ESP. And so could you just tell me again what that sequence of equipment would be.

A. I thought -- and since they indicated they were analyzing combination equipment in series, let's say. I was looking at a membrane bag, filter bag, followed by a wet ESP for the BACT analysis. Whether or not that was finally selected, that's a different story, but --

MS. SHROPSHIRE: We'll have more opportunities to ask questions during the course?

CHAIRMAN RUSSELL: Not of this gentleman.

EXAMINATION

BY MR. MIRES:

Q. I do have a question, and it's mostly for me for clarification and confusion. On 2.5 or 10 on this measuring, are we measuring all particulate matter, all elements, or are we trying to capture something in particular?

A. As far as what this equipment is doing?

Q. Yes.

A. For filterable particulate, the emission control devices in question here can't really differentiate with what we're catching. We're only catching it by the size. So it's like a sieve.

Q. So all particulate matter, regardless of what it might be?

A. Filterable, and then the condensible in the --

Q. Condensible being gas?

A. Gases, and primarily made up of your acid gases and the like that we're trying to filter that, but the dry filter equipment doesn't really do that good of a job on it because it's so fine. It's a gas, so it's just like -- and the flue gas passing through has nitrogen in it, it has oxygen in it, and has CO, that just goes right through it, for the most part.

Q. So this is just particulate matter, everything goes, all elements, everything?

A. Correct. It's really just filtering out by the size -- by its diameter, if you want to call it that.

MR. MIRES: That's clarified then.

EXAMINATION

BY MR. ROSSBACH:

Q. Let's go to the chart on Page 40, Exhibit 7. We talked about this chart, right?

A. Yes.

Q. And that's where we saw this combination of wet FGD and wet ESP as one of the combinations that was included in this chart; is that correct?

A. Well, I was saying it wasn't included, but yes.

Q. I'm not -- But it is in this chart. That's where we were talking about it.

A. Yes. We were talking about this time.

Q. I'm trying to clarify and maybe hypothesize what might have happened differently if we would have been looking at 2.5 instead of PM10. So you earlier testified -- And this chart then is like the matrix that you were talking about. You said you would do a matrix where we would look at the various technologies, and then determine a control efficiency for each of the various technologies; is that correct?

A. Yes.

Q. So this is kind of like the matrix that you were talking about, what you would do to look

at the different combinations?

A. It's simplified, but yes, it would be like that.

Q. So then each -- And the last column then is evaluating each of these chosen technology combinations for efficiency of controlling PM10, right? And then they have a number at the end; is that right?

A. Yes. In this case, though, they're really looking at controlling condensibles on this page.

Q. But just assume -- Let's look at condensibles, okay? That's fine. So if I were to -- So to come up with the number, the ninety, ninety, and eighty that's in this last column, you would have to go then -- as Ms. Kaiser was asking you -- you have to go basically to the vendors of these equipment, and you have to go to the vendor of the boiler, and you have to say, "Okay, with this boiler, and these particular types of equipment, we calculate that we're going to get an efficiency of PM10 condensibles of 90 percent for this combination, 90 percent for this, and 80 percent for that." Is that what you would do? That's the process?

A. Similar, yes. You'd really do it by each -- If you had a vendor that had both devices for the combination ones, let's say, you could ask him for both together. If you went to vendors that had only a single item, then you'd have to go to one, and then you'd have to go to the second one, and say, "Okay. Here is what you have coming in. What are you going to get from this?"

Q. But that's the process.

A. That's the process.

Q. You take the proposed boiler source, emission source, and then you take the proposed control technology, and you analyze what's going to come, and you get a number in the last column of your matrix which is your percent efficiency; is that correct?

A. Correct.

Q. If we were going to do this instead of PM10 at the last column, if we were going to do this knowing what you know about these various technologies, if we were to say instead, "We're going to require them to do 2.5, PM2.5," would the numbers then change in this last column?

A. Well, in this particular case, because they are talking condensibles -- and in reality,

they are talking PM2.5 in this page, just because the nature of condensibles is in the PM2.5 range -- I would expect these to stay the same. And if we added the technology that I'm thinking of, that efficiency would increase some.

Q. If we were doing filterable PM10 versus PM2.5, would we have -- Just assume. I didn't see a chart for filterable. I presume someplace in here that there was a chart. If we were going to get numbers for PM10 filterable efficiency for these different control technologies, would we get a different end result if we were looking at PM2.5?

A. Yes. I would anticipate it to be a lower efficiency.

Q. A lower efficiency for each --

A. For each one. Well, you've got to remember these are condensibles. You'd only have one column there, and that column would be PM2.5. You'd have two columns, PM10 and PM2.5. PM10 would have one efficiency, and PM2.5 would have another, and I would certainty expect the PM2.5 efficiency to be lower than the PM10 efficiency.

Q. But in comparing the different technologies, then would the PM2.5 technologies

then show a difference between the dry FGD, FFB, and the wet FGD, wet ESP, and the wet FGD, they would be markedly different then if you were doing the same type of analysis, one column for PM10 and then another column --

A. There would be one more efficient than the other. Typically I would expect to see the bag filter as the highest efficiency, and then the wet ESP very close to it, and then -- if they were all alone now -- and then the dry ESP on the bottom.

Q. And then if you were to do a combination, the combination you would propose would you expect would be the highest efficiency?

A. I would expect it to be the highest, yes.

Q. This is something that you could have done today, given what you know about the types of technologies that are available, even if you didn't -- Let's exclude the membrane bag. If you had done a wet FGD and wet ESP analysis for PM10 and PM2.5, and compared that to the others, would that have ended up with a more efficient -- more likely to be more efficient control of PM2.5?

A. You could do it, but of course, you need

a lot of the information that's not displayed.

Q. But you could do it? You have the information available to you?

A. My suspicion is if they're getting the same information that I request, they would have the majority. I would definitely be sure to have that information available in order to be able to do that analysis.

Q. In order to be able to do the analysis they did here anyways?

A. Yes, for the PM2.5.

Q. They could have done the same analysis with PM2.5?

A. I believe so, yes.

MR. ROSSBACH: Thank you.

CHAIRMAN RUSSELL: Any further questions?

Q. (By Mr. Rossbach) Let's look at -- Let me look at -- Tom pointed out Page 27. Here is the column for PM10 -- I mean for filterable on Page 27. Do you see Page 27, Mr. Taylor?

A. My 27 is --

MS. DILLEN: These are the missing pages. (Provides document)

Q. (By Mr. Rossbach) I think Page 27 and

28 is like at about page 42 or something like that, at least it was in mine. I had to find mine.

MS. DILLEN: Mr. Rossbach, is this the page that says "Filterable PM Table" on it?

MR. ROSSBACH: Right.

MS. DILLEN: They were missing pages from this.

Q. (By Mr. Rossbach) So you see this table here?

A. Yes.

Q. And so they didn't use a wet ESP for a control option for --

A. Or at least it's not on this tabulation.

Q. They may have, but you would have thought if they would have done it, it would have been included in the tabulation? I mean they did a wet FGD/wet ESP calculation for condensible PM10, but not for filterable PM10?

A. Right, at least is what this chart displays, yes.

Q. So if you had -- knowing what you know about these various technologies that are listed here in the technology column, if we had asked to do an estimated control efficiency for PM2.5 for

these technologies, would you have seen the same kind of efficiency?

A. No. The efficiencies would be lower.

Q. And if you had included some kind of FGD or baghouse technology combination with a wet ESP, would you have likely have gotten a similar PM10 but a higher PM2.5?

A. Yes.

MR. ROSSBACH: Thank you.

CHAIRMAN RUSSELL: Any further questions?

RE-EXAMINATION

BY MR. MIRES:

Q. On that same chart -- I'm going to follow up on his question, on Bill's question. How much lower would you anticipate seeing that?

A. Well, I look at it this way, just running quick numbers. For every .001 pound per million Btu drop, you're talking eleven tons a year, something like that. So if you just increased it to 99.9, you could see some -- drop this some. So you probably would see a 99.9 instead of 85. But again, that's looking at PM10. You really have to look at PM2.5 and see what the

differential is.

Q. That's what I'm trying to get at. Knowing what you know here, it had been --

A. I don't know what the component of the PM10 is for the PM2.5, but let's just for talking purposes say that 90 percent of this is PM2.5 coming out, as far as filterable. And that's conservative. It's probably more. And so you would increase that portion by 5 percent, so you'd be removing another eleven tons per year from the atmosphere, going out of the atmosphere.

One of the things you have to look at for any of the fine particulates is certainly the weight issue. When you look at the weight, there is a small component of the total emissions that is PM2.5, but it's the quantity of those particles. There is so many fine particles, and if you have large particles and a cup full of them, and you've got small particles and you have a cup full of those, there is a lot more of those small particles.

RE-EXAMINATION

BY MR. ROSSBACH:

Q. So what you're saying then is an eleven

ton difference or a ten ton difference, if it's PM2.5 that you're taking out, would be a lot of particles?

A. I'm just picking that. If you ratchet the emission rate from .012 pounds per million Btu down to .011. I'm not saying that that's what you would do, but I was just using that as kind of an example. Just going a little bit incrementally more, you would remove that eleven tons a year of PM2.5.

Q. But eleven tons of 2.5 is a lot more particles than eleven tons of PM10?

A. Yes.

CHAIRMAN RUSSELL: Anything further?

MR. REICH: If I might, just to clarify for the record what Mr. Rossbach was asking the witness. There is a chart at Page 25 that I think does clarify that the permit analysis does involve both a wet and a dry ESP. It doesn't say that specifically chart on 27. 27 is certainly just a summary of the chart on Page 25.

CHAIRMAN RUSSELL: Thank you.

MS. SHROPSHIRE: I just want to clarify on that. Maybe I can ask somebody else. It says wet or dry ESP -- I'm looking on Page 25, the

summary table -- that that is for filterable, not condensible; is that correct?

CHAIRMAN RUSSELL: No further questions. The witness is dismissed, and we'll take a ten minute break.

(Recess taken)

MS. DILLEN: There is one housekeeping that I have to raise. I'm intending to call Joe Lierow.

We received responses that would have been -- We received documents that would have been responsive to our discovery requests late on Thursday evening this past week. Mr. Lierow represented that he had not found them when he had gone through his files to answer our discovery request.

I don't know if he intends to rely on those, but some of them -- There was a 70 page document that was extremely technical, and in preparing this case, I have not had time to have an expert review it or even review it myself. So I would like to make sure in advance of his testimony that he will not be relying on these emails and technical documents that he has sent to me.

CHAIRMAN RUSSELL: I think we're agreeing to that. Katherine, you've never seen that document either, have you?

MS. ORR: No.

MR. McCARTER: I could represent that he does not intend to rely on them. We wanted to make of sure full disclosure because it came up at the last minute, and we sent them to you immediately.

MS. DILLEN: I'm not suggesting bad faith. I just don't want those documents to be part of those proceedings because I don't know what's in them.

MR. McCARTER: I don't think we do either.

MS. DILLEN: Calling Joe Lierow.

MS. ORR: Mr. Chairman, I might ask if there are any stipulations as to his being an expert, because he's going to be called by SME as well.

CHAIRMAN RUSSELL: He will be called again?

MS. ORR: Right. So they may be able to stipulate that he's an expert, and he's not --

MS. DILLEN: My understanding is that

he's being called as a fact witness by both parties in this matter; is that correct, Mr. Reich?

MR. McCARTER: Mr. Chair, members, that's correct. He is tendered as a fact witness, not as an expert witness, although he can testify as to the opinions that he reached during the process, but he's not going to be --

CHAIRMAN RUSSELL: We don't have to stipulate to anything.

(Witness sworn)

JOSEPH LIEROW,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MS. DILLEN:

Q. Good evening, Mr. Lierow. Is it true you were principally responsible for doing the BACT analysis for PM10 that SME included in its permit application?

A. Did you say principally?

Q. Yes.

A. I was in charge of creating the BACT analysis that was ultimately submitted, yes.

Q. Would you say of anyone working at -- Are you employed with Bison Engineering?

A. Yes, I am.

Q. Is Bison Engineering the consultant that SME hired to develop the permit application that was submitted to DEQ for the Highwood Generating Station?

A. Yes.

Q. And in that permitting process, I take it that you were in charge of doing the PM10 analysis that appeared in the permit application?

A. Yes, I was.

Q. And in that role, were you principally responsible for developing proposed emission limits for PM10?

A. Yes.

Q. Isn't it true that you were able to get workable information from your vendor, Alstom, as to what the PM10 emission from the boiler would be?

A. Did you say workable?

Q. Yes, I did.

A. Can you define --

Q. Were you able to rely on the specifications that Alstom provided you regarding

the boiler's emissions to conduct your BACT analysis for PM10?

A. Yes.

Q. Isn't it true that you looked at the estimates they'd given you for condensible emissions, and you found that you thought that they worked out correctly, and you relied on those?

A. On condensibles?

Q. Yes.

A. Yes.

CHAIRMAN RUSSELL: Hold on just a minute.

MR. SKUNKCAP: Mr. Chairman.

CHAIRMAN RUSSELL: Do you want to ask a question?

MR. SKUNKCAP: I do, before they get into it too far. Could you please explain the difference between a fact witness and an expert witness, please.

MS. DILLEN: Sure. An expert witness is someone who is regarded to have a level of expertise in their field that they can answer highly technical questions for the Court; whereas a fact witness is someone who witnessed events or

proceedings that are relevant to the case, and can be able to testify as to facts that might be able to influence your decision, but wouldn't be someone you'd question about technical matters. Does that make sense?

MR. McCARTER: Could I add something to that? The example that we've got in this situation is like a physician. If you call a physician to testify about his treatment of a patient, he's treating that patient as a physician and as an expert, and without being an expert witness for purposes of the Court, he can testify as to what he did. If he goes beyond that and testifies as to additional opinions, not just telling the body what he did and why he did it, then he would be an expert witness.

And we're not tendering Mr. Lierow for that. He is going to testify as to what he did, and what went into his report, and that sort of thing.

CHAIRMAN RUSSELL: And within the confines of why he did what he did.

MR. McCARTER: Right, why he did what he did. But he's not going to offer any new opinions that are not already in here.

Q. (By Ms. Dillen) Mr. Lierow, isn't it true that you were able to look at the numbers that Alstom had given you regarding condensible PM2.5 emissions, and conclude that they were reasonable numbers?

A. Yes, I did.

Q. I'd like to discuss with you how you came to some of these permitted, proposed permitted emission limits for condensible PM10. With regard to the sulphuric acid limit, wasn't it true that you worked backward from the limit that Alstom represented that they would guarantee in order to set that permit limit?

A. They gave me a number that was a value of one PPM, and I worked backwards to calculate a pound per million Btu number, which was ultimately submitted as part of the application.

Q. So Alstom give you a number, you figured out what that number would mean in terms of an emissions limit, and submitted that as your proposed BACT emissions limit?

A. Yes.

Q. And turning to page -- If you'll look at our Joint Exhibit 4 that are before you.

MR. REICH: What page?

MS. DILLEN: It's in 5-48.

MR. REICH: Of the permit application?

MS. DILLEN: Yes.

Q. (By Ms. Dillen) Mr. Lierow, are you familiar with this document?

A. Yes, I am.

Q. What is it?

A. It is the permit application that we submitted to the Department on 11/30/05.

Q. Under the section entitled, "Sulphuric Acid Mists," are you with me?

A. Yes.

Q. Could you read the second paragraph, please.

A. "The emission rate, although not the lowest, compares favorably to similar facilities in the RBLC presented in Table 5.3-29, and is lower than the recently permitted Gascoyne CFB boiler, and the two most recently Montana permitted facilities, Roundup Power and Rocky Mountain Power. Appendix B-6 contains a spreadsheet of RBLC BACT determinations."

Q. And the limit for sulphuric acid mist that you're referring to, what is that limit, in terms of pounds per MMbtu?

A. 0.0054 pounds per million Btu.

Q. So by your calculation, how many plants that you looked at in the RBLC are achieving a significant -- a lower limit than the .0054?

A. I see eight of them with lower limits, proposed limits.

Q. In general, when you conduct a BACT analysis, does it ever concern you to go with a limit that has been beaten by several other plants?

A. Are you asking if I'm concerned with that number? Did I hear you correctly?

Q. Do you ever feel that it warrants more analysis if you've come up with a permit limit that is significantly higher than the limit that has been set for other comparable facilities?

A. It could, yes.

Q. Why was it in this case that you were content to live with an average of the various emission limits that date back to 2001?

A. I didn't see this as an average number. I saw this as a value that the vendor provided, and I ran it through the BACT analysis, and it was an emission rate that they were willing to guarantee on a case-by-case determination. I felt

that that was a number that was considered -- that we wanted to pose for BACT.

Q. But you started with the number the vendor had given you; is that right?

A. Yes.

Q. And so did you ever from a clean slate go out and look at what technologies are out there to control sulphuric acid mist, and determine what the maximum reductions could be?

A. That's part of the BACT analysis on the previous pages. I looked at control technologies as part of the five step BACT analysis.

Q. Did you ever figure out why it was that these other plants were achieving such significantly lower emissions rates than the one that you had proposed?

A. I did not look at all of the ones here listed and try to dig in to find out why they were lower than the proposed facility.

CHAIRMAN RUSSELL: Does this have anything to do with the desulphurization, or is this an issue with BACT associated just with sulphur? Because we're doing PM2.5.

MS. DILLEN: These are the condensibles, and if you look at the permit application that

covers condensibles, sulphuric acid mist is one of those components, and the condensible emission rate was composed of emission rates for three or four different components, one was sulphuric acid mist, one was acid gases, one was trace metals, one was just called condensible PM10. And when all of those separate emission levels were added up, and then you added the filterable emissions limit, that's the total PM10 limit.

So what I'm trying to establish is how each of these separate limits that are making up the larger PM10 were established and really represent BACT.

THE WITNESS: Did you have a question that you had asked me? Was there one that I needed to answer?

MS. DILLEN: I think you had answered it.

THE WITNESS: I don't know if I was finished.

Q. (By Ms. Dillen) Okay. If you would like to finish your answer, please do.

A. You asked if I had looked at these, and I didn't look at all of them, but I looked at the top ones to figure out what type of a measurement

those would be those, and if you could measure that low, and felt like that was way lower than the recommended one PPM that I was told that was very difficult to test under.

So in my analysis here, I would think that these two facilities would have a hard time meeting such a low limit. That was my justification.

Q. But it's fair to say that the sulphuric acid limit here in your permit application is based on the Alstom guarantee; is that right?

A. Most definitely, yes.

Q. Moving on to a separate component of the condensible emissions for this plant, the acid gases, the HCL, hydrochloric acid, I believe, and the HF, hydrofluoric acid; is that correct?

A. Yes, it is.

Q. Are you on Page 5-49 with me?

A. Yes, I am.

Q. Can you read to me the second paragraph, beginning, "The proposed acid gas emission rates."

A. "The proposed acid gas emission rates, although not the lowest in RBLC, are an average emission rate for acid gas BACT determinations as presented in Table 5.3-30 and Table 5.3-31."

Q. So this limit is an average of the various emission limits that have been established elsewhere in the country; is that correct?

A. It compares to the average, yes.

Q. And here, what is the HCL proposed BACT emission rate?

A. It's in the previous paragraph. HCL, is that what you asked?

Q. Yes.

A. Is 0.0021 pounds per million Btu.

Q. And so by your calculation, how many plants around the country are doing better in terms of reduced emission rates for hydrochloric acid emissions?

A. I'll have to look on the next page, the table below, the first table is for HF. So there is one facility better than Highwood at .00118. That's Rocky Mountain Power.

Q. Did you ever look into why Rocky Mountain Power was able to achieve a lower emission rate than the one that you were proposing?

A. I didn't look specifically at the reasons or the calculations that went behind that facility. Once again, the emission rate that we

had looked at was one that we felt was achievable, and that could be accurately measured.

Q. And that was a case again where you were working off the rate that Alstom would guarantee; is that right?

A. Yes.

Q. Moving back to hydrochloric, Table 5.3-30. Can you tell me what the emission rate for the Highwood plant would be for HF?

A. Yes. 0.0017 pounds per million Btu.

Q. And by your calculation then, how many plants across the country would have lower emission rates than that .0017 rate?

A. It appears there are eleven, I believe.

Q. I think that's right. And it looks to me like there are at least three plants achieving a .0003 limit as opposed to Highwood's .0017 limit; is that correct?

A. Yes.

Q. Is it correct that there is an additional plant achieving a .0002 limit?

MR. RUSOFF: I've got an objection to the question. The table doesn't clarify whether or not those limits are being achieved or not. And for example, Bull Mountain Development Company

has never even constructed that plant.

MS. DILLEN: Well, if --

MR. RUSOFF: So my objection is that the question misstates the information on the table.

MS. DILLEN: My understanding is that these are permitted emission rates.

Q. (By Ms. Dillen) Is that incorrect, Mr. Lierow?

MR. RUSOFF: My objection was just --

MS. DILLEN: I'll withdraw the question.

Q. (By Ms. Dillen) Would you agree there are permitted, currently permitted emission rates, at least one, of a .0002 emission pounds per MBTu rate?

A. Yes. There are permitted emission rates lower than the proposed one at Highwood.

Q. And emission rates that range from in fact .0005 as compared to Highwood's .0017; is that correct?

A. Yes.

Q. And again, with respect to this emission rate that you proposed that's way down there on the list, did you look at any technologies that would help you to achieve a lower permitted emission rate?

A. I looked at the technologies that are within the BACT analysis that I have provided.

Q. And you never inquired as to why these other facilities were able to achieve lower emission rates, significantly lower emission rates than the one that you had proposed?

A. I don't believe most of these facilities have achieved these emission rates.

Q. Do you know that?

A. I know some of them haven't because some of them haven't been built.

Q. Which are those?

A. Right off the top of my head, Bull Mountain for sure, and I don't know -- I believe -- I'm going not going to say what I believe.

Q. Isn't it true that Bull Mountain was a facility that was permitted by the DEQ?

A. Yes, it was.

Q. I just want to make clear. These limits are all in finalized permits; is that not correct?

A. Yes, they are.

Q. And so once again, with respect to HF, were you relying again on the guarantee that Alstom said it would provide?

A. Yes, I did.

Q. I'd like turn to now to filterable emissions. Are you aware of any facilities that have been permitted that have lower emission rates than the .012 emission rate that has been negotiated for the Highwood coal plant?

MR. REICH: Objection. "Negotiated."

Q. (By Ms. Dillen) That has been set for the Highwood coal plant?

A. Yes. I'm sorry. What was your question?

Q. Are you aware of any plants that have been permitted with lower filterable emission rates than the .012 rate that's been set for the Highwood facility?

A. Yes.

Q. What are those facilities?

A. The two that are in the application are Reliant Energy, Seward Power Plant; and JEA Northside station.

Q. Are you aware of any other plants in addition to those two?

A. There have been a couple more permitted since then at .01 in Pennsylvania, I believe. But I don't have that information in front of me.

Q. Referring to the plant that you

mentioned first, the Florida JEA Northside plant, are you aware whether it's achieving its .011 filterable particulate emissions rate?

A. Yes, I am.

Q. And the answer is?

A. Yes.

Q. Yes. Okay. I didn't know if you were aware or if it was in fact achieving .011. And when you inquired into that, did you not find that it was, quote, easily achieving a .011 limit for filterable particulate?

A. Not at all.

Q. Do you remember being deposed by me in October of this year?

A. I remember that very well.

Q. Last year. I'm sorry. I'm referring to Page 21 of your deposition at Line 3. We had been discussing email correspondence.

A. Could you give me that reference again, please?

Q. Sure. Page 21, starting at Line 3.

A. Page 21 and what line?

Q. Line 3. You were discussing email information that you had received regarding the JEA Northside facility; is that correct?

A. Yes.

Q. And I said, "And I was just wondering, because there are some other emails related to this Florida JEA Northside facility, but I was unclear exactly what the limit was that it had easily achieved. Was that the .012 limit?" Answer: ".011."

A. I was correcting your limit number. I didn't answer your question.

MR. McCARTER: For completeness, I'd request that the next question be read.

MS. DILLEN: Sure. I'll read the next question.

"Oh, .011. Okay. Thank you. Now this is making sense to me."

If you want to read the rest, you can, but I don't think it's relevant.

MR. McCARTER: That's sufficient. Thank you.

MS. DILLEN: I'm sorry. We're dealing with different exhibit numbers than I thought.

MR. McCARTER: I believe the exhibit you're looking for is MEIC-F.

Q. (By Ms. Dillen) Mr. Lierow, can I refer you to our Joint Exhibit F.

A. Okay.
Q. Do you recognize this document as email?
A. Yes, I do recognize it.
Q. If you look at the second half of the page, is that an email from Ray Walters?
A. Yes.
Q. Is Ray Walters -- who is Ray Walters?
A. Mr. Walters works or worked for Stanley Consultants.
Q. Are you working with Stanley Consultants to -- Did you work with Stanley Consultants to develop the permit application, the design for the Highwood Generating Station?
A. Yes.
Q. And did he not say to you in the first paragraph of this email, "The results of the tests were published on the internet, and met limits with ease"?
A. Where are you reading that, please?
Q. I'm looking at the second to last sentence in the first paragraph. I believe this is -- This is an email from you on July 18th to Ray Walters; is that correct?
A. Yes.
Q. And in that email, are you discussing

the Florida JEA Northside facility that we've just been discussing here?

A. Yes, it is.

Q. And in the second sentence, the second to the last sentence in the first paragraph, can you read that?

A. Yes. "The results of the test were published on the internet, and met the limits with ease."

Q. So it's fair to say that during the permitting process for the filterable PM10 emissions, you were aware of at least two facilities that were permitted, and one at least that was achieving a lower limit than the .012 limit for Highwood?

A. Yes.

Q. And did you ever question how they were achieving that lower limit?

A. Did I ever question how they were achieving it? Is that your question?

Q. Yes.

A. I don't think I needed to question how.

Q. Did you ever investigate whether there was a way to achieve a .011 emissions limit?

A. I looked at what they had for controls

and -- from that perspective, if I understand your question. I'm sorry.

Q. Were these facilities CFB boilers?

A. I believe -- I'll go back and look at that table that we were looking at earlier. I believe so.

Q. I believe you testified to that.

A. Yes, they are CFB, or one of them is a CFB boiler. JEA is CFB.

Q. Did you ever investigate why these CFB boilers were able to achieve a .011 emissions limit, but you were proposing a .012 emissions limit for filterable particulate?

A. I didn't investigate it more than just looking at the compliance records.

Q. But you've testified -- or you at least emailed that the Florida JEA Northside facility was in compliance with its filterable particulate limit, and in fact had met that limit with ease?

A. As I stated in my email, yes, but not correctly.

Q. At the time that I deposed you, did you have any indication that the JEA Northside facility was not in compliance with its permit?

A. They are in compliance. I've just since

looked up to -- my recollection was fuzzy at the time. I went back and looked up those numbers.

Q. I think that this perhaps may be some of the information that you provided to me late last week or to your Counsel.

A. Not at all, no. Those were permits, Title 5 permits for the two facilities, not compliance records.

MS. DILLEN: I believe those Title 5 permits were part of the information that was provided to me, Counsel?

MR. McCARTER: Yes.

MS. DILLEN: Yes.

A. The Title 5 permits do not have testing results in them. I went back to the internet, and downloaded the compliance, or looked at the compliance records to recollect of what those emission numbers, stack test numbers were; and they did not meet them with ease, they barely made them. So my original email to Ray was not correct.

Q. (By Ms. Dillen) I see. But at the time that you were permitting this facility, you were under the impression that the JEA Northside facility was meeting a lower limit?

A. At the time I wrote that email, yes, but it may have been --

Q. And at the time I deposed you, that was your impression as well, was it not?

A. That was my impression, based on the email that I read back to you.

Q. And did you indicate anything other than that to me at that time when I questioned you about this?

A. I stated that my recollection had been a long time, and I couldn't quite remember.

Q. Isn't it true that you told me that you had included that information in the permit application, and that you hadn't considered it further or discussed it with the DEQ?

A. We didn't discuss those facilities specifically, but I did state in the application that there was limited -- which I can go to where it's stated in here under the filterable conclusions -- that there was limited data, there is limited evidence that facilities can comply with a .012 pounds per million Btu emission limit over the life of the bags, which may require more frequent replacement than estimated on Page 5-26.

Q. But it was the case that at the time

that you were developing this permit, and getting it approved, you understood that the JEA Northside was in compliance with its .011 limit; is that right?

A. Just barely, yes.

Q. Is it in compliance with its limit or not?

A. Yes.

Q. Is it true that the DEQ asked you to reconsider whether you might be able to use teflon coated bags and achieve a lower particulate emission limit accordingly?

A. I'm sorry. I don't quite understand your question. Can you repeat that, please?

Q. Did you first propose a limit of .015 for particulate emissions?

A. Yes, we did.

Q. At that point, did the DEQ ask you to reconsider that limit, and see whether you could achieve a .012 limit?

A. Not specifically, but they asked for more information to support that value, and we supplied more information.

Q. And was that additional information regarding the affordability of teflon coated bags?

A. Yes, it was.

Q. Did you ever consider whether the teflon coated bags that you had looked into could achieve better than a .012 limit, for instance a .011 limit or a .010 limit?

A. Not specifically, no.

Q. Mr. Lierow, was it your assumption during the permitting process that condensible emissions are mainly comprised of PM2.5?

A. Yes.

Q. And it was your position that you could nevertheless propose a BACT determined emission limit for condensible emissions?

A. I'm sorry. Please repeat that.

Q. Sure. I'll make it simpler. Did you propose a BACT determined emission limit for condensible emissions?

A. Yes, we did.

Q. Did you ever consider a combination of a wet ESP after a fabric filter bag?

A. No, we did not.

Q. To your knowledge, would water and water supply issues be a problem that would make the use of a wet ESP impracticable?

A. We didn't consider that in the analysis.

I'm confused on your question. I'm sorry. Are you referring to a wet ESP after, or ESP in general?

Q. Let's just say a wet ESP in general. Were you ever concerned that water would be a problem with respect to using a wet ESP?

A. Not a problem, but a concern. Water is always a concern in a dry climate.

Q. Isn't it true that you have negotiated water rights with the City of Great Falls that would give you free access to the Missouri River?

A. I'm not familiar with all those details.

Q. What's your opinion whether shortage of water at the Highwood plant would be a problem?

A. I don't know if I can answer that.

Q. I'll refer you to Page 53 of your deposition, starting at Line 13. Question: "Do you have a shortage of water at the Highwood plant that you're aware of?" Answer: "I don't know that answer. I don't believe it is, no."

Question: "Are you aware that part of the reason that the Highwood plant has been sited at the Salem site is that the Highwood plant would have access to the City of Great Falls water rights in the Missouri River?" Answer: "Yes, I'm

aware of that."

A. Yes, I am.

Q. Are you aware that SME is proposing to use an alternate test method to measure its compliance with the PM10 emission limit of .012?

A. Yes, I'm aware of that.

Q. Is it your position that that test method is a test method that has been already approved by EPA?

A. Please repeat that.

Q. Is that test method in total a test method that has been formally approved by EPA?

A. Which test method?

Q. What test method are you proposing to use to measure your condensible emissions?

A. I'm not sure what we've proposed of most recent time. I'm sorry. I haven't kept up with the appeal from SME on test methods and --

Q. So is it fair to say that you did the BACT analysis before you knew what test method you would use for condensibles?

A. Originally we proposed a modified test method.

Q. But that's not necessarily the test method that you're going to go with now?

A. No, it's not. The DEQ did not -- I don't know what the correct term is, but for lack of a better term -- like our proposed test methods. So that's been the whole case of appeal, I believe.

Q. So when you were doing this BACT analysis for the PM10, including the condensibles which are PM2.5 mainly, did you ever look into test methods, or put any narrative in your permit analysis about test methods?

A. We proposed that we used the modified test method for total PM10, yes.

Q. Where was that in your BACT analysis?

A. It's not in the BACT analysis. It's in the emission inventory.

Q. So when you did the BACT analysis, as part of that analysis and the analysis that you put forward in your permit application, there is no mention of a test method?

A. Not in the BACT analysis.

Q. Can you tell me who Mark Payne is?

A. He's an engineer at Stanley Consultants.

Q. And Stanley Consultants was retained by SME to help design the Highwood Generating Station, and help with permitting process; is that

right?

A. Correct.

(MEIC Exhibit A was marked for identification)

Q. (By Ms. Dillen) Mr. Lierow, I'm handing you what I've just had labeled as MEIC Exhibit A. Can you tell me what it is.

A. It's email correspondence that Mark Payne sent myself on November 6, 2006.

Q. Do you recognize it as email correspondence that is in your files?

A. Yes.

Q. And do you recognize it as a document that you and I have discussed before at your deposition?

A. Yes.

MS. DILLEN: I'd like to offer this into evidence as MEIC Exhibit A.

MR. McCARTER: I object. The matter here is irrelevant. It doesn't have anything to do with baghouse or baghouse filters. It has something to do with a completely different topic, which is filters for material handling.

MS. DILLEN: I think this email goes directly to SME's understanding of whether a BACT

analysis might be possible, and whether it might be required in the near future during the permitting process. I think I have to provide it to the Board so they can --

MR. McCARTER: I don't think that the testimony will bear that out, but --

MS. DILLEN: (Provides document)

Q. (By Ms. Dillen) Mr. Lierow, could you read me the second paragraph at the top of the page that begins, "In addition."

MR. McCARTER: Excuse me. Objection. That's hearsay. That wasn't authored by Mr. Lierow.

MS. DILLEN: First of all, it's a party admission, an email from Mark Payne, who was working for you. It's not hearsay because I'm not offering it for the truth that's asserted. I'm offering it as evidence of what the understanding of BACT requirements would be, and whether BACT regulations might come into effect during this permitting process.

MS. ORR: Mr. Chairman, that is a legitimate exception to the hearsay rule.

CHAIRMAN RUSSELL: All right. Unless I hear an objection, we'll allow it.

(MEIC Exhibit A
was received into evidence)

Q. (By Ms. Dillen) Could you read that second paragraph beginning "In addition," Mr. Lierow.

A. Yes. "In addition, if PM2.5 regulations come into effect, our solution to comply is to install higher efficiency bags. These will cost more, and require more frequent replacements. We probably don't want to get into a discussion with DEQ to avoid any tight restrictions being placed upon us."

MS. DILLEN: Thank you. We will conclude with that.

Excuse me. I'm unclear of whether we actually got this admitted into evidence or not.

CHAIRMAN RUSSELL: Yes, it is.

MR. McCARTER: Mr. Chairman, I think the way that I would request that this be handled is to go ahead and admit it into evidence, but I will inquire about this later to show that in fact it is irrelevant, but you have to look at it to see whether it is relevant or not relevant. I'd just request that you reserve judgment on that.

CHAIRMAN RUSSELL: I was hoping you

wouldn't just leave it in there without saying something about it.

MR. McCARTER: We'll provide something.

CHAIRMAN RUSSELL: Do you have any more questions?

MS. DILLEN: No. I'm turning it over for cross.

CHAIRMAN RUSSELL: We have a new Court Reporter that is going to start, and since this is kind of a nice time to break, why don't we go ahead and have Cheryl pick it up.

(Hearing recessed at 4:55 p.m. and reconvened with Cheryl Romsa reporting)

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C E R T I F I C A T E

STATE OF MONTANA)
: SS.
COUNTY OF LEWIS & CLARK)

I, LAURIE CRUTCHER, RPR, Court Reporter, Notary Public in and for the County of Lewis & Clark, State of Montana, do hereby certify:

That the proceedings were taken before me at the time and place herein named; that the proceedings were reported by me in shorthand and transcribed using computer-aided transcription, and that the foregoing -184- pages I contain a true record of the Volume I of the proceedings to the best of my ability.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal this day of , 2008.

LAURIE CRUTCHER, RPR
Court Reporter - Notary Public
My commission expires
March 9, 2008.