COMMONWEALTH OF PENNSYLVANIA

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF AIR QUALITY

VERBATIM MINUTES

MERCURY RULE WORKGROUP MEETING

TIME 9:00 A.M.

Rachel Carson State Office Building
400 Market Street, Room 105
Harrisburg, Pennsylvania 17105

OCTOBER 28, 2005

REPORTED BY:

Esteban L. Diaz
Diaz Data Services

AGENDA TOPICS

October 28, 2005

***

MR. FIDLER:

I felt the last session was an excellent meeting where we had a number of really good presentations made. For those of you who were not able to attend last meeting, there's a re-cap. If you were able to attend, we had presentations on deposition from Dr. Lynch from Penn State presenting wet deposition data that has been collected as part of a project under contract to us here at DEP over a number of years and by Dr. Levin of EPGA discussing issues related to global transport of mercury. We also received some valuable information on the Federal Rule recently adopted, the Clean Air Mercury Rule, cap and trade program, and also some information on initiatives in place in other States that have also chosen to go their own way and adopt a process for mercury emission control within their own respective States.

I thought the session, at the very end of the meeting, where everybody was very open and willing to offer suggestions on speakers that could continue to build an information base that

we can utilize as we make some decisions over the next month or two. And as a result of that, what we've tried to focus on today, and you can gather that from the list of speakers, is some information on health effects of mercury. We do have a speaker, Dr. John Bell from SAFRISK, will be starting, and then Dr. Donald McGraw, both talking about health effects resulting from mercury emissions and deposition of those emissions. We will have a presentation on the fish advisories in place within the State. And a little bit of I guess the mechanics as to how we established that advisory process and what contributes to us making those decisions.
And there was a request for information on chronology of the Clean Air Act implementation and what, what have been the results of all of the actions that have been taken over time. And Wick Havens is going to be trying to satisfy that request and present information today that's representative of what we've seen here by way of progress made, results achieved, through implementation of various initiatives here in the Commonwealth.

Again, the format will be the same. We'll

be providing opportunity and some time for information to be presented. We'll provide about 15 minutes following each presentation for open discussion and question. Any comments will be recorded. As I mentioned at the last session, we are transcribing the results of every meeting so that we have an accurate record of what everybody has offered. Sometimes things are lost in recording and transcribing recordings of meetings so that's why we've decided to utilize this approach. Not at all to replicate a public hearing format, but just to be as accurate as we can in transcribing the proceedings of each of the meetings. As a result of that however, I'd like to, as I tried to remind everybody at last session, as you make a comment, as you provide input, it's critical that you identify yourself so that we can accurately track who's offering what type of input, feedback, and information. By way of developments, since we've got a number of industry representatives here representing stationary sources, I'd like to mention that there has been some legislative activity this week. The Transportation Committee in the House voted out a Bill this week to rescind

Pennsylvania's Clean Vehicles Program. We'll be working very hard today to try to get the word out to as many folks as we possibly can about the potential impact on stationary sources if in fact we move from our scheduled clean vehicles program to the Federal Tier II program which is what the Bill identifies as the program that should be in place within Pennsylvania. If there's any bearing that any of you could provide to telling that story and helping us to inform and educate folks that are close to you, that would be very, very helpful, as I understand the Bill is to be voted on, on the full floor, on Tuesday. In fact I've got to leave in the next couple of minutes to make some calls myself. So I will be leaving for just a few minutes, but I will be back. I'd like to, unless anybody has anything to add before we get started this morning, I will start by introducing the first speaker. Are there any comments?

Let's go around the table and introduce ourselves again for those who may not have been able to attend the last meeting. John, do you want to start please?

MR. ARWAY:
John Arway, I'm Chief of the Environmental Services Division of the Pennsylvania Fish and Boat Commission.
MR. CANNON:
David Cannon with Allegheny Energy.
MR. TRISKO:
Gene Trisko, attorney. I'm here on behalf of the United Mine Workers of America International and their Pennsylvania Local and Districts.
MR. CLEMMER:
Reid Clemmer of PPL Services.
MR. BRISINI:
Vince Brisini, Reliant Energy.
MR. SPENCER:
Rick Spencer with National Wildlife Federation.
MR. MCPHEDRAN:
Charlie McPhedran with Penn Future, sitting in for Jan Jarrett.
MR. GRAYBILL:
Lowell Graybill with the Pennsylvania Federation of Sportsmen's Clubs.
MS. CONNER:
Gail Conner, Citizens Advisory Council.

MR. WELSH:
Mike Welsh, International Brotherhood of Electrical Workers.
MR. ELLIS:
George Ellis, Pennsylvania Coal Association. I'm sitting in for Frank Burke, Consol.
MR. BIDEN:
Doug Biden, Generation Association.
MS. WITMER:
Pam Witmer, Pennsylvania Chemical Industry Council.
MR. SCHMIDT:
Jeff Schmidt from the Sierra Club, sitting in for Nancy Parks. I would like to reply at some point to the announcement about the attempt to overturn the clean vehicles program, before he leaves.
DR. GOODMAN:
Cynthia Goodman from the Pennsylvania Department of Health in the Environment Health Division.
MR. STAMOULIS:
Arthur Stamoulis of Clean Air Council.
DR. SULLIVAN:
Terry Sullivan, Brookhaven National Laboratory.
DR. BELL:
John Bell, SAFRISK.

MR. CHALMERS:
Ray Chalmers, EPA Regional III.
MS. RAMSEY:
Billie Ramsey, ARIPPA.
MR. BARR:
Gene Barr, Pennsylvania Chamber.
DR. WESTMAN:
Roger Westman, Allegheny County Air Quality Program.
MS. EPPS:
Joyce Epps, Pennsylvania's Air Director. At this point what I would like to do is also to go around the room so that we know who's present. So if Dean you'll start on that side please.

***

[Introduction of audience.]

***

MS. EPPS:
Thank you for the introductions. At this point I'd like to introduce Dr. John Bell. Dr. John Bell is a principal and co-author of SAFRISK, LC, a consulting firm specializing in health, environmental and agricultural risk. In a career that spans 31 years he has worked as a

toxicologist both in academia and the private sector. He has extensive experience in the following technical areas: human health risk assessment; heavy metal toxicology; health and ecological impacts of combustion products; risk of petroleum constituents; strategic approaches to site remediation; and is a credible expert witness and litigation support specialist. He has approximately 90 publications and presentations and has been Board certified as a diplomat of the American Board of Toxicology since 1981. At this point in time I bring to you Dr. John Bell.

DR. BELL:

I didn't realize you were going to read all that. Good morning. Quite a varied composition in this group. What I was asked to do by Craig Evans in this presentation was to give sort of an overview of the health effects of mercury and the various species of mercury, but also to talk about the fate and transport of mercury a little bit, particularly as it pertains to combustion emissions and impacts on human health. From the agenda it looks like human health is going to get hit quite a bit today so I'm not going to spend a

great deal of time on that. I think there's some more interesting things in the second half of the presentation. So, let's just move on. You can tell I'm not an engineer.

What's the interest in mercury these last few years? I think that probably everyone will agree that the greatest impetus for both regulation and control of mercury emissions and the like is the perception that mercury in fish is going to present a great health problem to the citizens of the United States. And this is reflected in the fact that we see fish advisories I think in almost every State in the Country right now warning people to restrict the amount of fish they are consuming because of the potential for mercury exposure. So what I'm going to do, as I said before, I'm going to speak, break up the talk into two different portions. In the first portion I'm going to talk about some of the things we know about the toxicity of mercury, particularly as it related to combustion emissions.

I'm probably preaching to the choir here but really the three mercury species that we're most concerned with are elemental mercury, divalent

mercury, which is mercury on the +2 charge - oxidized elemental mercury, and methylmercury. Obviously methylmercury is not emitted from combustion sources, but as we'll talk about in a little more detail as we go through here, you should probably be familiar that once divalent mercury gets into water systems, due to microbial action in the water sediment interface, you can get the formation of methylmercury, ethylmercury, and several other organic mercury species. And these ultimately, in an environmental setting, turn out to be the species that are most, of most concern from the public health perspective. All right, we know quite a bit about mercury toxicity. If you've got a few months and go into the literature, you'll be buried by the numbers of studies that have been done, both in animals and human exposure situations, trying to define the mechanisms of action, what the impacts of mercury exposure are.

There are a couple of classic high level exposures that are a part of the mercury literature and I just wanted to briefly touch on those first of all. The first occurred in Minamata Bay in Japan. And this was probably one

of the, one of the bell-weather events in terms of organic mercury toxicity. To give you a little bit of background if you're not familiar with it, there was an industrial discharge of mercury waste from a factory on Minamata Bay. They were discharging this waste in their aqueous waste stream from 1953 through 1960. There were many, many residents around the Bay and they used the Bay for subsistence fishing. And through some very interesting epidemiological observations the, the question was quickly asked, "There's something wrong with what's going on in the Bay." Crows, birds that were eating fish from the Bay were falling off perches. There were problems, health problems, behavioral problems with cats that were eating fish from the Bay. And ultimately, it was determined that the inorganic mercury that was being discharged into the Bay was being converted to organic mercury which was being taken up by the fish, which was being caught by the residents and consumed. And overall there were approximately 2,200 people, residents in that area impacted by methylmercury toxicity. And of those there were some 12 deaths.

There's another interesting exposure scenario in Iraq and this happened in 1971 when 90,000 metric tons of seed grain, which was treated with methylmercury as a fungicide, were distributed throughout the Country. They had warning signs, the seeds were actually painted purple pink color as a warning. Unfortunately all the warning signs on the bags of grain were in English. They were distributed throughout the Country and the people used this seed grain as a source of flour for baking. And, there were over 6,000 people impacted by the ingestion of methylmercury in this episode and about 460 deaths. Unfortunately because of the turmoil obviously that's been going on in Iraq with the Iraq Iran war and subsequent wars, it's been very, very difficult to do any sort of follow-up on these folks. But, you know, it was a fairly high level exposure that was easily identified as to its source.

Some of the clinical symptoms that were observed from both of these high level exposure scenarios, it became obvious that if women were exposed during pregnancy that their offspring could be impacted as a result of the

methylmercury exposure that the mother took in. And, as children from these mothers grew older, some of the symptoms that were seen were mental retardations, cerebral palsy, deafness, blindness, and slurred, slow, difficult speech, like I just had a moment ago. But again, these is from a relatively high level exposure and, as we'll talk a little bit as we move forward, this should not really be confused with a situation that you normally see in an environmental exposure which is, you know, considerably lower. As far as adult exposures in both of these situations, the primary things that were seen were sensory impairment and motor impairment. Again, primarily central nervous system impacts. All right, as I said on the very second or third slide, we're talking about three different forms of mercury. Elemental mercury and divalent mercury do appear in combustion emissions. Methylmercury is formed in the environment after divalent mercury gets into a water body. So, what I'm going to do briefly is go through the toxicity of these three different types of mercury, three different species of mercury, to give you some appreciation for perhaps why we see

some of the toxicity that we do see from them. Elemental mercury is the one that you're, you know you've probably all seen it in high school, looking around it depends on the age I guess. When I went to high school, we had, we were able to play with jars of liquid mercury in the lab and play around with it and look how neat the bubbles are and everything else when you drop it on the table. I saw a very interesting article in National Geographic several years ago, National Geographic Magazine, where they took a vase of liquid mercury and shined ultra-violet light through it against a screen in the background. And there was this incredible vapor coming off the surface of this vase full of mercury. So these things weren't really appreciated, you know, back in the '60's when I went to school, but they're certainly appreciated now. A very, very volatile compound. The critical organ for the toxicity of elemental mercury is the brain. And I've got kidneys down there and as we go down a little bit, we'll understand why I've got kidneys up there as well. One of the reasons the brain is a target for elemental mercury is that it's a very, very lipid

soluble metal and the usual exposure is through inhalation. So once it's inhaled, it rapidly distributes throughout the body, and because of its lipid solubility, will get into the brain, cross the blood-brain barrier which normally will exclude compounds. In the body elemental mercury is very, very quickly oxidized. In other words it goes from having no charge to having a +2 charge. Once it gets a +2 charge it effectively is barred from getting across the blood-brain barrier. So there's this balance that's set up. You get the exposure, it tries to distribute throughout the body, but as it's distributing it's also being converted into divalent mercury. So, there's sort of, you know, a balance of how quickly the oxidation occurs versus how much gets across the blood-brain barrier into your brain. Because of the way it's distributed and because it is converted into divalent mercury you end up finding a lot of mercury in the kidneys after an exposure to elemental mercury. Again, it's a result of this conversion to divalent mercury. The primary mechanism for getting rid of divalent, one of the mechanisms for getting rid of divalent mercury is filtration through the

kidneys. And it turns out to be an organ which, in trying to handle divalent mercury, also accumulates it and can become a target of toxicity itself. So, again, what you're talking about with the inhalation exposure to elemental mercury, you've got this equilibrium going on about how much gets into the brain. Once it gets into the brain, it can be oxidized and trapped in there. You also have it being converted in the rest of the body and getting to the kidneys and being trapped and accumulated in the kidneys where it can produce toxicity as well. Most of the toxicity that you see nowadays, it's not very common to see it nowadays because most of the exposures had been occupational in the past, chloralkalide plants, facilities that manufacture fluorescent bulbs and the like. There's been a great deal of attention paid on the occupational level now so exposures are really restricted. So it's not something that you see a great deal of. We've already talked a little bit about divalent mercury. You know, that's part of the problem with these three compounds is that, as you can see, they're all very, very related. They're related in the environment and they're related in

the body as well. And you can get conversion back and forth from some of these forms. But divalent mercury is a species that is emitted from combustion processes. So it is something that you're going to find. It is, as you already know, probably part of the major concern in terms of air dispersion from a combustion source. I already said that due to the ionic charge it does not readily cross the blood-brain barrier. It also doesn’t cross, very easily cross, the placenta because of that same, that same charge characteristic. The toxicity of divalent mercury is believed to be mediated through the binding to sulfhydryl groups which are, again if you remember your chemistry, this is a bond to a protein through a sulfur and a hydrogen, and divalent mercury is very effective at binding and bridging sulfhydryl groups. And when it does so with critical enzymes, it can interfere with the function of that enzyme. It's also believed to be able to change the structure of proteins by that binding. So it's believed that this is the common mechanism really for all the forms of mercury that we're talking about – binding to sulfhydryl groups. Divalent we said, the kidneys

are the target organ for toxicity from divalent cations. There's a binding of mercury to sulfhydryl groups, presumably in the lumen of the proximal tubule of the kidney, which interferes with the reuptake of components from the filtered urine and the function of the kidneys itself. There's also some evidence in animals that there's an immunological component to divalent mercury toxicity in the kidneys and this may also exist in the humans as well. But basically the bottom line is that it interferes with kidney function, can damage kidney function.

This is really the compounded interest, I think from when we're talking about mercury emissions from a combustion facility, because ultimately divalent mercury that is emitted and ultimately gets into a surface water body faces a potential of being converted by microbial action into methylmercury. And methylmercury has some very interesting characteristics which you'll see can enhance its potential to cause toxicity. As we said already, the critical organ for toxicity is the brain. It readily crosses both the blood-brain barrier and the placenta because methylmercury is a very lipid soluble compound.

Remember we said that divalent mercury is charged. That charge really prevents it from crossing membranes whereas in its organic form it can actually dissolve through and across membranes in the body. So it can be quite widely distributed. It accumulates in the brain and is slowly converted to divalent mercury. And in doing so it contributes to the trapping and accumulation of methylmercury in the brain. Again, it's believed to produce its toxicity through binding to sulfhydryl groups and there's still some argument as to whether the methylmercury itself is binding to the sulfhydryl groups or whether there's actually a conversion, a local conversion, of methylmercury to divalent mercury, and that's what's binding. But, it really doesn't make a great deal of difference. It's, the mechanism is believed to be mediated through this binding to critical enzymes or proteins in brain tissue. And the very young appear to be particularly sensitive. And that's really what has led to a lot of the fish consumption advisories that are obviously targeted at pregnant women or women of child bearing age.

Pharmacokinetic parameters for methylmercury, that's a lot of words to say something that's really quite simple. The key here is that the oral absorption of methylmercury is extremely efficient. Greater than 95% of what is ingested is absorbed from the gut into the body. Now, if you contrast that with divalent mercury, if you eat fish, for example, that contain divalent mercury, only about 7% of the mercury that's in, of what's ingested, gets into the body. The rest of it passes on through. So this characteristic of methylmercury, again, works against it because, you know, if you have it in the food that you're consuming, it's going to be absorbed from that food into the body. And then we start to see the trail of toxicity that we referred to a few minutes ago. Absorbed dose in the blood – 6%, what I put that up there for is that methylmercury distributes throughout the body very quickly so that after an exposure situation, very little of it, only about 6% is present in the blood. And that can create some problems obviously that you see with the last part of that, the body half-life – anything that's not found in appreciable concentrations in

the blood is not going to be available for the normal elimination pathways very efficiently. So you're not going to get kidney filtration or transport through the bile back into the gut or metabolism in the liver, because you've only got 6% of it in the blood. The rest of it's distributed elsewhere in the body. So these are some characteristics that sort of tie into methylmercury as being a, being the species of concern from a toxicity point of view.

There's been a lot of attention paid in the last few years on several human exposure situations from fish ingestion of mercury. You know, as I said, there have been several incidents of acute exposure to fairly high levels like the Minamata Bay and the Iraq exposure situation, but researchers have focused on several populations that consume a lot of fish and, as you probably already know, mercury is ubiquitous. It's everywhere. You'll find mercury in fish throughout the world. So epidemiologists have been very interested in zeroing in on populations that consume a lot of fish -- basically, subsistence fishermen. And to try and set up some studies to try and determine what sorts of

toxicity you might be seeing from, I don't like to use the word "low level environment exposure," but compared to the acute exposures we were talking about earlier, these are environmental exposures. These are the levels of mercury that are found in the fish that people are eating. So what sort of effects might we be seeing?

This first study was conducted in the Faroes Islands, and I had to actually look up in the atlas to find out where the Faroes were because I didn't know this, and they're in a delightful area northwest of Scotland between Iceland and Norway. I can't imagine what the winters are like there, but, I thought Wisconsin was bad. They are characteristic in that they eat fish and whales – a lot of fish and whales because they are a fishing population. They are Scandinavian in origin. And so, epidemiologists decided that this would be a great population to study for long term effects of mercury exposure. So they set up a prospective developmental study that involved 900 mother-infant pairs. And they took, I believe they took both maternal blood level and hair level mercury measurements on these pairs, no I'm sorry, they took cord blood on these. And

they subjected the children to standardized neuropsychological tests at the age of 7. These are normal developmental type tests, intelligence tests for a specific age group. And then they compared them against age match controls in the same population, or low mercury exposure controls in the same population, to see if the exposure to mercury in the diet had any impact on the development of these kids. And in fact they did determine that there was statistically subtle dose-related developmental effects measured in the children at 7 years of age. The study was complicated a little bit because they also found because these people also ate a lot of whale meat that they were exposed to PCBs through the whales as well. So there was this complicating factor in there, but this turned out to be the study that EPA used to update their reference dose for methylmercury. And even when they corrected for PCB exposure, they're still confident that there was a mercury-related impact on development of these children.

A second study was conducted in the Seychelles. And these islands are a thousand miles from Africa in the middle of the Indian

Ocean. It's like some researcher just decided this would be a great place to go and spend 6 months. Again, a fish-eating population. They set up again a prospective developmental study that involved 779 mother-infant pairs and they were followed, the kids were followed from birth to 5-1/2 years and again subjected to the standardized developmental tests. This study sort of complicated the picture because, although they saw what they believed to be mercury-related impacts on development in the pilot study they conducted, in the main study they did not see any mercury related developmental effect. And, in fact, there's been some recent reevaluation of the data and there's some suggestion that, you know, I'll throw this out for what it's worth, that there was actually an improvement in the development of some of these children as a result of exposure to mercury.

It sort of raises, I'm not going to spend a great deal of time talking about it, but you probably have already heard there's always this dilemma, you know, warning against fish consumption because of the presence of mercury, but everybody knows from a public health perspective that

eating fish is good for you. So, you know, do you tell folks not to eat fish, do you encourage them to eat fish? How do the good impacts of eating fish with the omega-3 fatty acids and the like and, you know, the low-saturated fats balance off the low level mercury exposure that you might be getting at the same time? That one has not been sorted out yet. Okay, so the Faroes study did indicate that there was an impact on development, this one did not.

And again, this is a third study that was conducted in New Zealand. They started out with, looking at 11,000 mother-infant pairs. The mothers submitted hair samples and completed a dietary survey. Out of those 11,000 mother-infant pairs, they found 1,000 mothers who consumed fish more than 3 times a week throughout their pregnancy, and 73 of these mothers had hair mercury levels that were greater than 6 parts per million. So they set up, again they've done a number of studies on these data, but the primary one they looked at was, again, subjecting the infants to, or the kids to developmental psychological testing at 4 years and again in the 6-7 age group. And they were matched against

children from mothers with lower hair mercury. So it was like a greater than 6 parts per million in the hair and less than 6 parts per million. And they too determined that there were dose related developmental effects related to the higher level of mercury exposure.

Coffee break already? I'm sure you're ready by now.

All right. I'll quickly move through this. I just want to make sure that you understand what a reference dose is. This is a value that gives an indication of the potential toxicity of a compound and it's based on non-cancer endpoints. We really don't have any evidence that any of these mercury species that we're talking about are carcinogenic. So we're talking about non-cancer endpoints. One of the things that, sort of the holy grail of toxicology, is that non-cancer endpoints usually/almost always exhibit a threshold so that as you increase the dose level, you see no effects until you reach this threshold exposure and then you start to see toxicity. And that level where you start to see it is called a threshold. And as opposed to the cancer paradigm where it's, there are people who believe that

exposure to one molecule will result in the potential of a cancer forming. So, the reference dose really counts on this being, mercury toxicity being a threshold event. And the definition that EPA uses that the reference dose is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime of exposure. So this is a level that you can be exposed to every day of your life and not expect to see any toxicity. And there's a safety factor, as it implies, built in to deal with sensitive populations. Usually based on animal studies, it's expressed as a daily dose, milligrams of mercury exposure per kilogram of body weight per day. So again, you can take your dietary exposure scenarios and come up with a, with a daily dose converted in that way. So it's usually based on animal studies. Methylmercury, the most recent reference dose from EPA is not based on animal studies, it's based on the data from that Faroes study that I just mentioned, so it's human data, presumably more reliable.

All right, there also is a reference concentration which basically has the same sort of meaning although instead of a daily ingestion dose, we're talking about an inhalation exposure level. So this is an air concentration. So this is referred to, obviously, as the EPA's reference concentration. It's to develop against, to protect against inhaled exposures, often based on occupational exposures, and it's expressed in terms of an air concentration. Again, it's an air concentration that you can be exposed to throughout your lifetime without, you know, expecting to see any harmful effects.

All right, I'm going to have to pick up speed a little bit. The important thing about this slide is that the old way of coming up with a reference dose is that you or the researchers or whoever was evaluating the data, looked at dose response data. As I said before, as you increase the dose of exposure to a compound you should see a dose related increase in the severity of the toxicity. So, you know, a little bit of poison doesn't cause much of a problem. As you increase and increase and increase, you can go through a spectrum where you go from

subtle effects to serious effects, ultimately to death. And this is true for most compounds, including water. So when you're trying to figure out a reference dose, normally what you would look for is what's known as a NOAEL, which is a No-Observed-Adverse-Effect-Level. So you take this dose response information, you've looked at various exposure levels, what you're doing is you back down until, at the dose, you look at the doses and you back down until you don't see any response. This is your No-Observed-Adverse-Effect-Level. It's, you know, as it says. And typically then what EPA would do would be to take that dose that doesn't show a response in this test situation and add safety factors, or what they call "uncertainty factors" to it. So that they would, ultimately they would move that dose down perhaps 100, you know, up to 10,000-fold. To say that okay, if we're exposed at this level, we're comfortable now that there's enough of a safety margin here that an individual is not going to see any sort of toxicity. The problem with looking at a No-Effect-Level is you don't know how far away that No-Effect-Level is from where the Effect-Level starts. Because you're

looking at the absence of an effect, not the presence of an effect. So to summarize a ton of work in a very few sentences, what EPA has done is move toward looking at what's known as a benchmark dose. Where now they look at again, this dose response curve, they fit a line to this dose response curve, and instead of trying to go below that to a No-Effect-Level, they look at some defined increase above background. And in the case of methylmercury, they looked at a 5% increase above background as being sort of where you might start to see toxicity. And they then took, they then take because they're doing statistics on these data, they take a confidence limit on that value and take the 95% lower confidence limit on that. So it's, it's a really pretty conservative level, but it is right at the bottom of the dose response curve. And it gives more information than the old way did. I'm sure I lost everybody on that. It's not something that you can really describe in a couple of minutes, but.

All right, this just gives you some information on the reference doses for the various mercury species that we're talking about

here today. And you'll see that the numbers that have the double asterisks beside them, these are values that have come out of EPA's IRIS database. These are sort of official, peer reviewed, toxicity values and you'll see that there's one for divalent mercury and there's one for methylmercury and there's a reference concentration, as you might expect, for elemental mercury because it's an inhalation exposure problem. In the italics I've also shown that, the document that these came from which is the guidance document for conducting risk assessments for hazardous waste incinerators, EPA has also calculated some of these other values, but they have not been subjected to the same sort of peer review evaluation that the IRIS values have. Basically what they've done is say, okay if an oral value is this, if we apply a couple of numbers, we can convert it to an inhalation dose and that's what it would be. It's kind of sloppy, sloppy toxicology, but it, you know, that's what they've done. No editorializing. And, again, you're probably not going to use this, but I thought it was interesting that you have this information. Once you have a reference

dose, basically all you do is compare a reference dose to an estimate of the average daily intake or daily dose and if the daily intake is greater than the reference dose, you end up with a hazard quotient that exceeds 1. And if you have a hazard quotient that exceeds 1, you should be concerned that there's a potential for health effects. If it's less than 1, you know, you can be fairly comfortable that there's not a problem. Because remember what we said the reference dose was, that's an exposure level that you can be exposed to every day of your life without seeing any harmful effects. Usually it has some safety factors built into it as well. So, you know, if you're the sort of person who likes to take fish mercury concentrations and convert them into some sort of a health risk, then you can use that equation. The daily intake is quite simply the average daily consumption rate for fish and the concentration of mercury that's in the fish. So, you know, you can crunch the numbers yourself. You don't need consultants.

That's the quick and dirty toxicology portion of this. I should probably have done this last because toxicology always puts people to sleep.

You start talking about toxicology and risk assessments and foreheads just go to the table. I'm sorry. Second part, anyway, what do we know about the fate and transport of mercury species associated with combustion? Again we're, you know, our concern is with these three compounds, three species. Now I'm going, hopefully you can read this in your handout a little clearer than it is here, but the next slide will make it a bit clearer and I've got the pointer right here. This diagram again is out of that human risk assessment protocol that EPA just finalized in 2005 for conducting risk assessments on hazardous waste incinerators. And they put this scheme in the guidance to, this is their default understanding of what happens to mercury once it comes out of the stack. They start with the assumption that 80% of the total mercury is in the vapor phase, 20% is in the particle-bound phase, okay? And what they've done here they've included, you start with the total emissions of 10 grams and as you move through it you can see how we end up some of these final numbers. All right, so of this 80% that's in the vapor phase, 60% of the total is divalent mercury vapor, 20%

is elemental mercury vapor. Okay, the 0 charge, the +2 charge. 20%, this 20% that's particle-bound is essentially all divalent mercury, it has a +2 charge. Now, part of the reason I guess why we're here today is that EPA recognizes that of the mercury that is released from a point source, more than 50% of it does not act locally – it enters what's known as the global cycle – it's gone, moves east in the winds. Now, this has some advantages if you're dealing with local effects from a point source like an incinerator that you're trying to get permitted for example because of the mercury that's coming out of the stack, you're only showing about 48% of it acting locally. The rest of it is not really having local impact at all. But from an overall perspective, somebody to the west of you may be sending mercury your way which is ending up, you know, acting in your area. So, the fact that it goes into a global cycle does not really explain it away satisfactorily. It's still there, it still has a potential to do things and it's largely responsible for why you can find mercury almost everywhere you look in the world. It's naturally occurring obviously, but also, you

know, you look at emission sources in China, India, Korea, the like, you know there's an awful lot of mercury going into the environment that's the global environment that's just circulating. I'm going to move to the next slide because I've got a more simplified version of that, but basically what EPA does you know with this scheme is that starting with the 10 grams, I'll move to the next one because it did not do very well. Okay, we're starting again with the same assumptions. 20% elemental, 80% divalent, that's the assumption that EPA is making as their default. That's the form of mercury that's coming out of this stack. Again, we'll start with 10 grams. It's allocated as 2 grams of mercury vapor, 6 grams of divalent mercury vapor, and 2 grams of particle-bound divalent mercury. Of that, 1% of the mercury vapor is acting locally, 68% of the divalent mercury vapor, and 36% of the particle-bound. And if you look at that in terms of how many grams that is of your original starting 10, you end up with .02 grams of the mercury vapor and a total of only 4.8 grams of divalent mercury. So, again, in terms of local impact, divalent mercury is by far, you

know from a mass perspective, the most important. This is the compound, this the form which is going to get into the food chain and have the local effects and remember long-term, down the road, it's going to get potentially converted into methylmercury.

MR. SCHMIDT:

Are you saying that 68% of the divalent mercury that's emitted has, is deposited locally?

DR. BELL:

It acts locally, yes.

MR. SCHMIDT:

Acts locally, not global transfer.

DR. BELL:

If you go back, and unfortunately it's not all that clear here, but this is the divalent mercury vapor. They're saying 68% acts locally, 32% goes into the global cycle.

MR. SCHMIDT:

So that might contribute to what some people call mercury hot spots.

DR. BELL:

Yes.

MR. SCHMIDT:

Thank you.

DR. BELL:

Now there's been, you know, quite a bit of controversy about this assumption that what comes out of the stack is allocated 20% elemental and 80% divalent. And certainly from the hazardous incineration perspective, it's known that some of the air pollution control devices, electrostatic precipitators for example, are really quite effective at stripping divalent mercury out of the emissions. And I'll show you the next slide. Rather than go with the assumption, the default assumption, of 20%/80%, I worked on a facility where they were able to demonstrate actually that the removal of divalent mercury was so efficient that the split was actually 90% elemental and only 10% divalent. And, you know, I put this slide, this table is to show what you end up with if you, if you follow the same assumptions that EPA did with the default. Again, starting with 10 grams total of emissions and having, these percentages are exactly the same as in the previous slide, and now you get .09 grams of the original 10 grams acting locally as mercury vapor and only .6 grams of divalent acting locally. So that's a total of .69 grams, and if I push the

right button, the previous slide, as opposed to 4.82. So, you know, measuring what's coming out of the stack, the speciation, is going to be helpful.

The second part of this talk is to try and point out some of the potential pitfalls in, you know, you know what the toxicity of methylmercury from fish ingestion is, how do you relate that back to what's coming out of the stack? And I guess what I'm trying to show you is that it's not a simply process – that there are a number of things that can have a profound impact on that. Obviously any sort of change, alteration, air pollution control, which can take care of divalent mercury is going to have a significant impact on local impacts. So this is one area. All right, so that's what's coming out of the stack. Once it comes out of the stack what happens to it? It can be, I believe you had a presentation at the previous meeting that talked a little about some of the air dispersion and deposition and things, so I won't spend a great deal of time on this, but certainly mercury species that come out of the combustion stack are subjected, can be subjected to both wet and dry

deposition. You can have wet and dry deposition of vapors and you can have wet and dry deposition of particles. Wet deposition obviously are associated with rainfall events or snow events, where you're physically trapping the compounds and bringing them down to the earth's surface. Dry deposition you're talking about, you know, settling based on the aerodynamics of the particles, you know, as they move across and are getting trapped on the earth's surface or on foliar surfaces or what have you. But they can come down, we know that. This is also out of that 2005 risk assessment guidance document, and if anybody's interested I can give you the web site to get a hold of that, it's really fun reading, it's about this thick. When the mercury comes out obviously it can be deposited on soil surfaces. Once it's on soil surfaces and incorporated into the soil, it can be ingested by humans through incidental ingestion – kids playing in the backyard, it can be taken up into plants and eaten. Again, it's not very effectively accumulated in plants and the important thing to remember is that the emissions, mercury emissions coming out of the

stack and impacting the soil are going to be primarily in the divalent form, the ionized form, which are not particularly well absorbed from the gut if they are ingested. Okay? We talked about that, only about 7%. The default value that EPA uses for, in this guidance document, they assume that 2% of the total mercury that's deposited onto soil surfaces gets converted to methylmercury, so that there's a low level of methylmercury in the soils. But, again, it's really not a significant exposure source. The other obviously exposure pathway is through inhalation because you have mercury vapor and you have divalent mercury vapor and you have particles air born as well in the vicinity of the facility. So there's the potential for air born exposure through inhalation. The big concern, the biggest concern I would say though is getting into surface water bodies. You have these same things that I just talked about in terms of the deposition occurring on watershed soils. So that you get mercury, divalent mercury primarily, but a little bit of methylmercury, in the soils of watersheds. They are then subjected to, well you can see by direct deposition. You can also have

impacts on the surface water body itself. You can have compounds depositing through wet deposition into, onto surface water bodies, diffusion from air into surface water, and probably the larger concern though is runoff from impacted watersheds. You get the deposition onto the soils of the watershed, you then have rainfall events, and it, they wash from the watershed into the surface water body. Once they're in the water body, you know, they can be subjected to benthic burial which means that they get, they're in the sediment and they can be covered by more sediment so they're essentially a sink such as you see often with PCBs. Once they're covered with layers of sediment, they're not really available for entry into the food chain. But they're there and they're going to stay there. And you also have the potential for volatilization of compounds out of the surface water body. So, really when you're evaluating, trying to predict what this total water body concentration is, you can see that it's really a pretty complicated process and there are a lot of assumptions and a lot of uncertainty associated with that process.

MR. WESTMAN:

Dr. Bell, you have about 5 minutes.

DR. BELL:

Yikes. Okay. I'll pick it up. This slide I put up here just to show that, we've talked about it although I'm not going to spend very much time talking about it, that microbial action within surface water can convert divalent mercury to methylmercury and that's the potential problem. I put this slide up really to demonstrate that there are a number of site conditions that can impact the efficiency of that methylation process. And really we don't have time to go into too much of it, but, you know, to be aware that things like changes in pH or changes in dissolved oxygen can have an impact on the rate of methylation. The main purpose again of this is to demonstrate how difficult it is to predict what's going, how much methylation there's going to be and how much is going to get in the fish.

Very quickly, this is the equation that is used to predict the tissue concentrations in fish of methylmercury. It's a fairly simple equation. You start out with the dissolved concentration of methylmercury in water and a bioaccumulation

factor. If I haven't said it, I've implied that the problem with methylmercury is that it's formed by microorganisms in the water and it moves progressively up the food chain due to those very characteristics that we talked about earlier. It's a highly lipid soluble compound. It gets into the organism. It does not get eliminated from the organism. So you have this organism at lower trophic levels sucking up the methylmercury and, you know, it turns out to be somebody else's lunch for the day and it moves on up the food chain. And as it moves up, it doesn't get very effectively eliminated. So that you can end up with fairly, fairly high concentrations at the highest level of the, the highest trophic level fish, the carnivorous fish. This is the equation that EPA uses to estimate what the concentration in these trophic level fish are. Trophic level 4, which are the highest trophic level fish, they use this in the risk assessment process to evaluate potential human health effects. So, again, you start with the concentration, dissolved phase concentration of methylmercury, a bioaccumulation factor, multiply the two together and you get a concentration in

fish. If you know what the daily ingestion rate for fish is, you know, you can convert that to a dose. And away you go.

This is to show you various trophic level 4 bioaccumulation factors that exist. EPA uses this value right now which is the same one that was in the mercury study report to Congress in 1997 and that number, when you look at that number as it relates to the previous equation, that's 6.8 million. Okay, so you're starting with the concentration of methylmercury in the dissolved phase of a water column and you're multiplying that by a factor of 6.8 million to come up with a concentration in fish. Of interest, the ambient water quality criteria document that EPA put out for methylmercury in 2001 had a somewhat lower value, 2.7, 10 to the sixth. The second line of this I put up here because I think it's important. The assumption that EPA makes in their risk assessment is that everyone who consumes fish are consuming solely top trophic level fish, carnivorous fish, and although in their guidance documents, they show bioaccumulation factors for lower trophic levels, these are the fish that are eaten by these fish,

you can see that they're considerably lower. And when you get down to trophic level 2, they're even lower than that.

And I have contended several times that it's unrealistic to assume that people are only consuming top of the food chain level fish. It just doesn't happen. And I pulled together a couple of tables here, this is some information that we've collected during some of the risk assessments we've collected. These are data from fish populations in the Ohio River. These were from sports fishermen surveys. So, we have fish collected as a percent of total, fish meals consumed again as a percent, and in this situation, you know, 65-75% of the fish that were consumed, caught and consumed, were in fact trophic level fish. And, you know, 26-35% were lower trophic level. So, again, if you assume that 100% consumption is highest level trophic level, you're going to be overestimating the exposure to mercury. In the Wabash River it was even more interesting. There's a caveat to this study because this was actually a survey done by the Indiana Department of Natural Resources. They went out and electro shocked, did a survey

by electro shocking. So, you have to make the assumption here that there's some correlation between the populations of fish that are present and what's being caught. This is not actual consumption or catch data. This is population data. But again, these numbers are really quite dramatic that only, you know, 9-11% of the fish that they collected were trophic level 4 and the rest were, the vast majority were less than trophic level 4. So, you know, it's important I think if you're doing risk assessments, or if you're in fact dealing with questions about mercury exposure through fish consumption, that you keep this sort of thing in mind.

Almost at the end. This is not of too much concern. I just wanted to throw it in there to show that you have different bioaccumulation factors if you're talking about flowing water, surface water systems as opposed to stagnant non-flowing. There's apparently an effect on the uptake of methylmercury in those conditions as well.

Different States and EPA have different assumptions for how much fish a person eats each day. It makes it very difficult to regulate. It

makes it very difficult to estimate, you know, is what's coming out of the stack going to cause a health problem. There is no common metric as far as the United States is concerned that's accepted nationwide. You have subsistence fisher levels, you have recreational fisher levels, some States use their own, some States use EPA's values. Again, it's an uncertainty.

Don't need to spend much time on this. I thought it was quite interesting in that it shows the average concentrations of fish methylmercury collected from surface water bodies that are under consumption warning so that, you can't really see it and I can't really see it hardly, but these are taken from 1987 through 2003, they were collected by EPA. And you can see the numbers of samples that were looked at and these are the average methylmercury concentrations. Again, these numbers correspond to these bars, so it's going from lowest to highest, and it demonstrates that as you might expect, the highest concentrations are in the highest trophic level fish.

All right, not too bad. Summary and conclusions. I covered a lot of stuff and I

appreciate that most of you seem to have stayed awake. What can we conclude from all of this? Most of the stuff on this first page, you should already be familiar with. Concern associated with emissions of mercury from combustion units results primarily from impacts on surface water. Mercury gets to other locations and exposure sources, but really it's the surface water impacts that seem to have the most public health concern. Inorganic mercury in water bodies can be converted to methylmercury which readily bioaccumulates through the aquatic food chain. Everybody knows that. Consumers, including man, located at the top of the food chain can be exposed to elevated dietary levels of methylmercury. The primary concern appears to focus on exposure of the fetus or nursing neonate to methylmercury ingested by the mother. There's some epidemiological evidence to suggest that low level methylmercury exposure can have neurodevelopmental impacts, although you really do have to take away the message that this is still a work in progress.

Cautions? In the brief opportunity I've had, I hope that I've been able to instill in you

that the fate and transport of mercury species in and around surface water bodies is extremely complex and can be influenced by a number of external factors. Controversy, that I referred to earlier, that subtle developmental impacts resulting from fish ingestion may be offset by nutritional benefits, i.e., exposure to the omega-3 fatty acids, and I think there's actually a, there's a NOAH study going on right now to try and balance the risks versus the benefits of fish consumption. And the last one here, that there's a high level of uncertainty associated with the prediction of methylmercury exposure levels based on stack emissions. If you just go to the end and say, okay I have a measured concentration of methylmercury in fish, you can be fairly comfortable with whether or not that represents a toxic potential. It's far more difficult to say, I've got x amount of mercury coming out the stack, what is that going to do to those fish concentrations? That is an extremely complex process and it's fraught with tons of uncertainty. So, you know, I advise caution in approaching that.

I think that's it. Thank you for your

patience and…

MR. FIDLER:

Thank you very much Dr. Bell. Questions, comments for Dr. Bell? Please identify yourself.

MR. BRISINI:

Vince Brisini, Reliant Energy. I was wondering just for, better than high or low, I mean, is there a listing of what the dose levels are for the Japan incident and Iraq and how do they compare to the studies at Faroes, etc., New Zealand? And how do they compare, you know, kind of in a chain of exposures, dose levels, how do they compare to the EPA reference dose? I mean as far as a level of magnitude?

DR. BELL:

There're obviously far higher, but I don't have the specific numbers. They, they did, I know they collected hair mercury levels from the Iraq study and I think they had blood data from the Minamata exposure, but I don't have the numbers.

MR. BRISINI:

Would it be possible somehow to get those kinds of orders of magnitude, whatever those levels are?

DR. BELL:

Sure.

MR. BRISINI:

I mean I think that would be, I think…

MR. TRISKO:

They're available in the NA, the National Academy of Science, methylmercury…

DR. BELL:

And the, again, another good source is that ambient water quality criteria document that, for mercury, that EPA put together in 2001.

DR. SULLIVAN:

As I recollect those numbers were about 50 to several hundred parts per million hair in the Iraqi and the reference dose is roughly 1.1 parts per million hair. So a factor of 50 to 100 at least. But you'd want to go back to that study and look at those numbers.

DR. BELL:

I think that what would be more helpful to you too is that they do have blood data I believe for the Faroes epidemiological study as well, cord blood data. So that would be a help in making that comparison.

DR. SULLIVAN:

Yeah, Faroes and Seychelles are generally 5 to 10

parts per million hair, so they're much below the Iraqi numbers, but they're above what the EPA reference dose is.

MR. FIDLER:

Sir, could you please identify yourself?

DR. SULLIVAN:

I'm sorry, Terry Sullivan, Brookhaven National Laboratory.

MR. BRISINI:

Okay, Vince Brisini again. So, what we're saying is maybe 500 times higher than the dose level for the Iraqi, Japan. Maybe 5 times higher for the Faroes Islands study?

DR. SULLIVAN:

50 to 100 times higher for Iraqi and 5 to 10 times higher for Faroes and Seychelles.

MR. FIDLER:

The question was raised about having access to the National Academy reports. We will certainly try to get copies of those reports and make them available at the next meeting. Anyone else? Comments, questions?

MR. ARWAY:

John Arway, Fish and Boat Commission. Dr. Bell, you mentioned about the literature not containing

much benefit/risk comparisons in the same study. A number of years ago, two or three, I presented at a toxicology conference in Burlington. There was a paper from researchers from the University of Washington in collaboration with the University of Texas and Carnegie Mellon and they presented benefit/risk on the same graph for mercury exposure. And their basic conclusion was that for the sensitive populations, the benefits were greater than the risks if you deviated from the recommended dose prescriptions, for the sensitive populations, or the risks were greater than the benefits for the sensitive populations. The benefits were greater than the risks for the non-sensitive populations for fish consumption.

DR. BELL:

As I say, this, I believe right now, the National Academy is conducting an evaluation of that, sponsored by NOAH, I think. So, I mean that's going to be very interesting. And, you know, I should have pointed out, even on that Wisconsin fish advisory which I showed on the first slide, or second slide, they are careful to point out that there are benefits from consumption of fish and, you know, from a public health perspective

it's very difficult to balance those two things.

MR. ARWAY:

Pennsylvania's advisory program tries to emphasize that too.

MR. FIDLER:

Gene Trisko.

MR. TRISKO:

Thank you Tom. Gene Trisko for the United Mine Workers. I had the please Dr. Bell of attending all of the public meetings of the NAS Committee on methylmercury and you've given this group an absolutely superb concise summary of much of the evidence that was discussed during that lengthy process before the NAS. And I compliment you for your concision in that regard. I had a couple of clarifying questions about your discussion of the Faroes Island and Seychelles and New Zealand studies. The results presented for the Faroes study which seemed to me to weigh more heavily in the judgment of the NAS in its final report than did the Seychelles results, those study results consisted of a number, a large number of batteries of tests that were conducted on the subject population. My recollection is that the positive statistical associations that you

mentioned, I think your phrase was "a subtle statistical association," that those were observed only in a few of the test batteries, not in all of them. Such as, for example, the Boston naming test, that comes to mind.

DR. BELL:

Yes, that's correct. The Boston naming test was one of the primary ones where effects were seen.

MR. TRISKO:

Right. And with respect to the New Zealand study, my recollection is that a statistician from ICF presented a thorough reassessment of the New Zealand data and pointed out a number of outliers in the observations and when those outliers, or statistical sports so to speak, were removed, then much of the positive association evidence seemed to disappear in effect.

DR. BELL:

You are absolutely correct. It was Kenny Crump.

MR. TRISKO:

Kenny Crump, exactly, Dr. Crump of ICF. And that as a consequence of Dr. Crump's analysis, the NAS did not appear to weigh the New Zealand study results heavily at all in its final assessment.

DR. BELL:

I think what you say is fair and I think EPA in developing their reference dose came to the same conclusion. They focused primarily on the Faroes study.

MR. TRISKO:

Right. And finally, just as an observation that when all was said and done and the NAS Committee considered the evidence before it, it had one study, the Seychelles study, that interpreted in one manner would suggest that there were positive developmental effects associated with mercury consumption by the fetus at relatively high levels, and another study, the Faroes study, in which negative impacts were observed in some of the tests, and the NAS using a prudential principle elected to give the Seychelles Island, pardon me, the Faroes Island research a greater degree of weight in its consideration. You don't have to comment on that, it's simply an observation.

DR. BELL:

You know, again, for anyone who is really interested in this particular subject, I would recommend looking at the NAS documents and looking at the EPA's ambient water quality

criteria for methylmercury because, you know, they're voluminous and they're controversial. The epidemiological studies have been evaluated by many groups and they come up with many conclusions. And, you know, it's a very, very difficult thing to, you know, come up with a concise answer because by its nature, developmental human epidemiological studies are very, very difficult to interpret. And again, as one other caution, in all three of these situations, you're trying to apply, you know, they are human data, but they are not North American human data, they are very homogeneous populations. That was another thing that came out in those reports that I didn't mention. It was a criticism that they're, they are a very closed population, particularly the Faroes, they're Scandinavian in origin and it's a fairly closed population as opposed to how diverse our population is. Again, it just introduces uncertainty that you have to be aware of.

MR. FIDLER:

One more question. Yes?

MR. STAMOULIS:

Arthur Stamoulis of the Clean Air Council. I

guess we know that different species of fish can have different concentrations of mercury depending on, you know, where they are in the food chain. I was sort of struck, you know, we know that U.S. FDA has fish consumption advisories for certain species of fish while other species are assumed to be much safer. I was struck that on this chart that has the average mercury concentrations in fresh water non-commercial fish, some of these species are approaching the levels found in swordfish which FDA warns women not to eat because of the health impact. And a number of them, quite a few of them are sort of similar to the levels found in albacore tuna which FDA warns people not to eat because of the, or to limit their consumption of because of the health impact. I was wondering, I don't know if you have it or someone else, but some data about fish caught in Pennsylvania and the levels they have because I was struck by how high the levels were in many of these non-commercial fish.

DR. BELL:

In answer to the last part of your question, I don't have data for Pennsylvania. The other

caution I guess in looking at that graph is that those are averages, simple arithmetic averages. They don't show any confidence limits at all, so what you're saying is correct, that there are going to be fish that were sampled that are going to be considerably higher than those average values, and keep in mind that the FDA action level is 1 part per million. So, you're right, when you look at the bottom of that graph, some of those species are definitely approaching that action level.

MR. FIDLER:

I'd like to thank Dr. Bell. I think this has been very helpful and good discussion. Let's take about a 7 or 8 minute break rather than 15 minutes and reconvene at 10:35 please.

[BREAK]

MR. FIDLER:

Thank you very much for returning on time. I'd like to introduce our next speaker. Our next speaker is Dr. Donald McGraw. Dr. McGraw was referred to us by my counterpart from the Allegheny County Health Department. Dr. McGraw has fields of specialization in occupational medicine, environmental medicine, physical medicine, rehab of workers, and toxicology consultation, and epidemiology. Dr. McGraw is a faculty member at the Johns Hopkins University and without going into a tremendous amount of detail, if there's anything you would like to add Dr. McGraw, please feel free to do that, to inform everyone of your qualifications. And I'll turn the floor over to you. Thank you very much for being here.

DR. MCGRAW:

Thank you for your kind introduction. I assume this is on.

DR. FIDLER:

That is for the minutes, it's not going to broadcast on the PA system.

DR. MCGRAW:

I see. Well, let me make my disclaimers first.

First of all I'm from Pittsburgh and I'm a practicing physician there. I'm a clinician who has been practicing in and around the University of Pittsburgh Medical Centers for approximately the last 25 to 30 years. And I've been on the faculty at the University of Pittsburgh Schools of Medicine and Public Health for that period of time. So when I'm not practicing, I'm teaching medicine, residents, and medical students. And the rest of the time I'm just seeing patients. I've had various posts at local hospitals with the University, at Presbyterian University Hospital, Shadyside Hospital, and I'm currently on staff at those facilities as well as the West Penn Hospital. But I don't, I don't, I'm not actively employed by them at the present and I'm just an independent practitioner. I see occupational medicine, environmental medicine, toxicological patients in my practice. And so what you'll hear from me today is a very pragmatic kind of approach. I wouldn't qualify myself as an expert in this field, but like everything else in occupational and environmental medicine, I see patients, I read extensively and try to keep up with the literature in the various

areas that involve potential poisonings or whatever the case might be. And the material that I've used to put this little presentation together is taken from all public sources. It's taken from Federal Government documents and from papers that have been published in the peer reviewed literature. It is, and from other sources like the CDC, from conferences that I've attended on the subject. So what I know I've gleaned from other people's expertise and put that in the practice, in my own clinical practice. So, therefore, don't hold me responsible for the information I'm presenting. I believe that it's factual, there's always an interpretation involved, and what you're going to get is my particular interpretation. I'll also have to apologize for my current medical state. I've developed an unfortunate cold over the last couple of days so I'll do my best with that. So please forgive me if I start coughing or have to blow my nose intermittently through the process. I may also require technical assistance from time to time. This is a little more exotic than what I usually have available to me.

Some of this you may already have heard and you

probably will be hearing again, but I have tried to be as simplistic as possible in dealing with these issues because that's the only way I can address them.

A little background on what mercury is, it's derived from the Greek meaning "water silver." It's a naturally occurring metal, mined largely as mercuric sulfate from cinnabar ore and there are three primary forms of mercury, all with individualized toxicity. First there's elemental or metallic mercury, then there's inorganic mercury salts, and finally the one that really has, I think, the most significant potential impact on humans, and that's organic, and most commonly, methylmercury. Elemental mercury is the only metal which is a liquid at room temperature and it's found still in a wide variety of instrumentation including thermometers, blood pressure cuffs, instruments that we have in the hospital and medical and dental practices, batteries, fluorescent light bulbs. It's been around for a long time, but a number of particular applications have disappeared over the years. Some dental fillings are composed of about 50% metallic mercury. I'll

talk a little more about that a bit later in my presentation. Exposure may occur if some of these instruments are broken. When metallic mercury is released into the environment it vaporizes as a colorless, odorless gas, and as the temperature increases the vaporization increases. And this is the same process that takes place naturally in the environment when you have vaporization of metallic mercury from the oceans, from the soil, from rocky outcroppings where it's mined, from volcanic eruptions. And these vapors do pose a potential significant health risk.

I'm sure some of you, some of you are nearly my age peers although I could be the senior member in the room at this moment, but I remember as a small child breaking more than one thermometer accidentally and then taking out the mercury and rolling it around and playing with it and one of the fun things to do was to take out a few coins, silver coins, and you could polish those up to make them almost brilliant. And it was just a great deal of fun for a little kid to do. The shine would only last for 24 hours or so, but it was pretty neat. Now fortunately for

me, I didn't know any better, but playing around with that could have caused some harm if I had allowed the mercury to go into the carpet or to get spread around the room. And I, I don't know, I might have done that too because those little balls roll around pretty fast and they are a little hard to clean up once they get to that point. The thing to remember, and like a lot of practitioners, have gotten calls from anxious parents whose child has bitten off or broken a thermometer and maybe even thought to have swallowed a small amount of that metallic mercury. And I've been happy to tell them that they needn't worry because you can eat quite a lot of that shiny little rolling metal without having to worry much about it. It's going to go right through the GI system and come out the other end. Where you get into trouble is if you roll it around on the carpet, it stays there, and in time it vaporizes and you inhale that over a long period of time.

Inorganic mercury salts are the result of a combination of mercury with other elements – chlorine, sulfur, oxygen, etc., and exists in the form of powder or crystals. In the past, again

referring to my own generation, mercurochrome was a staple of growing up in the '40's and '50's and we, every time I turned around and had a little nick or scratch, my mother who was a public health nurse, had the mercurochrome out and I had stripes of that stuff all over me. And I guess it's probably still around in some places, but you don't hear much about it. It had a very distinctive odor and was nice and red so it was sort of a badge of honor for a little kid to bang it around the countryside. There was about 2% mercury in mercurochrome which was maybe the widely used skin antiseptic at the time. Merthiolate was another commonly used skin antibacterial. There are still some medications containing mercury around. I'd say the majority of them are in ophthalmic products – contact lens solutions, eye drops, some in vaginal gels and suppositories, and I expect there are still some worming medications in veterinary practices where it exists. It used to be in laxatives, teething powders, and in creams that were used to lighten the skin. Thimerosal I won't mention until later but it has been used as a preservative, particularly in vaccines and has been a subject

of some public controversy. And mercuric sulfide and oxide are still sometimes used as colorants, and have been in the past, in paint and tattoo dyes.

I'm going to hop around, back and forth, between the different forms of mercury to try and distinguish them. Organic mercury, most oftenly occurring as methylmercury, is the most common form and is generated by micro biota in the environment, bacteria and fungi, that convert other forms of mercury into methylmercury in the ocean and in the landscape as well. When the adverse health effects of methylmercury were recognized in the 1970's, fungicide use was banned in the U.S., but it did continue to be used in other parts of the world. In 1990 phenyl mercuric compounds were prohibited from use as antifungal agents in both indoor and outdoor paints due to concerns about the release of vapors from those paints. The greatest concern for methylmercury, as everyone probably already knows, is derived from its uptake by fresh and saltwater fish and shellfish. Those fish at the top of the food chain, the larger fish, are going to have the most because it bioaccumulates – the

longer the fish lives, the more it's going to have. So if you catch a big whopper, then you're going to get more than if you have a little sunfish. And of course large fish, like whales, have the very most that you might accumulate. Sea mammals also have it. So if you're fond of seal and eating blubber, then you're going to get an even higher dose of methylmercury. The FDA has estimated that the average individual is exposed to about 50 nanograms of mercury per kilo body weight or 3-1/2 micrograms of mercury per day. Now there's a big range that goes from 50 to 100 and so there's a considerable variation in that.

Now going back to the environment, elemental mercury is part of the crust of the earth. It's constantly being released through erosive forces of nature -- wind, water, volcanic activity. And human activity has been responsible for what has been estimated, well it's not really clear, and no one's been able to figure out exactly what the contribution of anthropogenic activities is to mercury in the environment. Somewhere around maybe 1/3 is the best estimate that I've seen, and that's a very general term. About 80% of

mercury from human activities, about 2,000 tons is metallic mercury released to the air predominantly from mining and smelting of ore, but with lesser contributions from fossil fuel combustion and solid waste incineration. 15% derives from fertilizers, fungicides, and municipal solid waste. And about 5% is generated from industrial waste water. In 1991 the World Health Organization reported that the major source of atmospheric mercury was global degassing of mineral mercury from the hydrosphere at a rate of about 3,000 to 6,000 tons per year. Obviously a wide spread because it's only an estimate, but representing about 1 to 3 times the rate of that derived from human sources. The variable overall contributions by human to natural is not known, as I said, due to the significant and diverse contribution from the environment itself which obviously has been accumulating for thousands of years. And so there's a residual that's being constantly recycled through the action of this degassing process in the environment. So some of that mercury, if you could measure it, has been around for tens if not hundreds of thousands of years

because it's being reprocessed, recycled from one form into the other on a continual basis. The atmospheric levels of mercury breathed in the air of our general environment are very low and do not, based on everything that I have been able to read in the literature, represent a significant potential adverse human health source.

Surface soils have been shown to contain anywhere from 25 to 625 nanograms per gram of mercury, or nanograms of mercury per gram of soil. Ocean water may contain varying from 3 nanograms per liter in the open sea to 5 or 6 in coastal waters. And surface waters have been shown to have upwards of 50 nanograms.

Inorganic mercury compounds represent a relative minor exposure source because there really aren't that many products around which would enable human contact of it in that form. And most contacts with inorganic mercury are more likely to be intentional, or as the result of an accident in handling it in the workplace.

The natural production of methylmercury by oceanic plankton, bacteria and fungi generate the disproportionately largest human exposure source through the consumption of marine life as we've

said. And when methylmercury is released from the microorganisms in water they generally stay there a long time. They tend to settle out and gravitate to the bottom. They usually stay on soil surfaces as well and don't generally move into the ground water.

What happens when mercury enters the body? Well, as I mentioned before, when you, when you ingest metallic or elemental mercury it's largely going to pass through the system in tact and will be excreted by the feces predominantly, and the urine. When exposure is high the urinary route will dominate. Inorganic mercury tends to pass through way, the same routes, and the half life of elemental mercury is about 50 days when it's inhaled but because methylmercury is so easily capable of passing through tissue, fatty tissue, the blood brain barrier, the placenta, a lot of it may find its way to the brain and that's the danger of inhaling elemental mercury, mercury, or methylmercury which may be, or inorganic mercury which can be converted into other forms in the body. Now when inorganic mercury enters the body if it's in small amounts it too can pass through. But if you ingest a large enough amount of some

mercuric salt, ergo inorganic forms of mercury, it's extremely corrosive to the lining of the intestinal tract and the stomach and thereby can do a lot of damage on its way through and certainly can become more absorbable. It, as I said, is not something most people are likely to be exposed to in this day and age although in many parts of the world various forms of mercurial salts are still used in religious and cultural practices and in herbal medications. It's still used in voodoo rituals and other rites in different parts of the developing world. And there are greater opportunities for ingestion and toxicological effects in those settings.

As an old teacher I can't pass up the opportunity to point out historical literature. Bernardo Ramazzini who's commonly thought of as the grandfather of occupational medicine, and lived in the 17th and early 18th century wrote about the effects of mercury that he saw in miners of his era. And these individuals had obviously very high exposures and the results were the horrible neurologic effects that we use to describe the potential for harm even today. They became palsy, paralytic, lethargic, they lost weight,

they lost their teeth. They developed what in 19th century England became known as "mad hatter's disease" because the hatters who were working at that time were using it in the preparation of the linings and the bands of the hat. They licked their fingers and pretty soon, unfortunately for them, they became like characters from Alice in Wonderland and developed what has come to be known as erethism with mood swings, at times violent behavior and totally uncontrollable impulses that were very frightening to both the general population and even physicians of the time. Ramazzini also quoted a predecessor of his, Jean Fernel, from France who similarly described what was happening what was happening to painters who licked their brushes after dipping them into mercury containing paint. And we have a very colorful medical literature describing what might occur, the brain damage that might occur from exposure to mercury long before anyone had any idea of how exactly that it occurred or what might be done about it. Currently there are about 70,000 workers in the U.S. working in industries, and I've got a list of some of those potential work sites attached to

the end of the presentation, who are exposed. Most of them are in the mining industries and production of the products from the mercuric ores. However, the workplace of the 21st century is much more controlled than the past and actually more of the unknown and dangerous exposures seem to be taking place among the health professions – dentists, physicians, hygienists, and others working in areas where elemental mercury gets spilled, vaporized, and inhaled.

Contemporary concerns for the potential for human mercury toxicity for the general population are really focused on the consumption of fish and shellfish. The earlier exposures to inorganic mercurials through seed dressings of wheat and other such things are well known and, as I said, those were banned. There were epidemics in Iraq in 1956 and '60, I'm sorry, in 1971 and 1972 with some 8,500 poisoning cases and nearly 500 deaths from the ingestion from homemade bread made from treated wheat seed. The most well known public exposure took place in Minamata, Japan, in 1956 when inorganic mercury effluent from factories was methylated by microbiota and ended up in the

local fish which were being consumed on a regular basis. And of course there were devastating developmental effects in the children of that village. Interestingly the mothers, who were also consuming the fish, were not similarly affected.

Methylmercury is about 90% absorbed through the GI tract. And once it enters the blood stream, it can cross, as I said, into most tissues very easily, including the brain where it can be converted into inorganic mercury and end up staying a lot longer.

What are the potential adverse health effects? As in anything else in toxicology, that's dependent on dose, duration, the route of exposure, and then, to a much lesser extent, personal characteristics – age, sex, diet, genetic traits, lifestyle, etc.

Again, acute inhalation exposure to elemental mercury can irritate the mucosal linings of the mouth and GI tract and range from mild gastritis to severe ulceration. There can be nausea, vomiting, diarrhea, eye irritation, and a number of other alterations. Chronic exposure to airborne vapors may lead to the chronically

described tremors and neuropsychiatric symptoms that were described by Ramazzini and others hundreds of years ago.

The target organs of inorganic mercury poisoning are the GI tract and the kidneys. On an acute basis, many of the same effects can be noted as are seen with metallic mercury poisoning. If the exposure is high enough, there may be potential for acute renal failure. Chronic effects are similar to those of elemental mercury exposure. Early on in the literature a condition known as acrodynia, or pink disease, was described, particularly among children where there was redness and peeling of the skin, cramps, salivation, sweating, fever, insomnia, and weakness. And that was believed to be due to a sensitivity reaction. Since the early description of that condition, it has also been seen in teenagers and adults so it's not restricted to children.

I have included a line in a couple of places in here indicating that there's no scientific evidence to date to suggest any increased incidence of cancer of any type with exposure to elemental or inorganic mercury. And not that

we're talking about that constantly, but everyone always has cancer on the mind and it's always something that's not far from a point of concern, and I think it's important to recognize that that's not an issue related to any type of mercury toxicity.

MR. FIDLER:

Dr. McGraw, you've got about 5 minutes.

DR. MCGRAW:

Oh, I'm sorry, I guess I'm moving a little too slowly here. Similarly, with methylmercury there has not been any incidence of increased cancer among experimental animal studies.

What are the best tests used to determine the presence of exposure to mercury? Urine measurement is the best measure for inorganic mercury. A 24-hour urinary measurement should be performed on individuals in the workplace. I won't go through the OSHA TLV and TWA standards, but those are well established and in place. The EPA has recommended an ambient hair level standard of less than 10 to 20 nanograms per cubic meter. And there are also a lot of discharge limits for various industrial facilities. Again, to diagnose acute mercury

exposure, a quantitative 24-hour urinary measurement is the best.

Hair testing is something that's talked about a lot. I see people coming in and they've been told that they have high levels of mercury in their hair. And this is really pretty useless unless you're conducting an epidemiologic survey and you have comparisons, controls and standards. Hair growth being what it is and the length of people's hair varying to the extent that it does, it really is not a very useful test for clinical measurement. Commercial laboratory studies have shown that there's a very poor level of consistency and reliability among the results. When blood mercury levels are present and absent urine mercury levels are present, this is indicative of organic mercury exposure. So if you're looking for the level of mercury in someone who's just been eating fish, then you want a blood mercury level. You're not going to see anything useful in the urine.

There are posted averages correlating to the number of fish meals that you might eat and the blood mercury level. Those are all listed and anyone can get access to those. There are some

interesting stories about individuals who are consuming fish. There was one person who is reported as having consumed a can of tuna fish daily for five years, a 54-year old man. When his mercury level was measured it was 52 micrograms per liter. He was absolutely asymptomatic and wasn't aware that this was happening. He reduced his intake and it was in half in about 80 days and down to 7 micrograms in 7 months.

Dental amalgams has been a source of some controversy and I'll only say this in passing – yes there is some release of mercury from dental amalgams but it has yet been shown to be significant enough to be associated with any adverse human health effects. Whereas if you undergo a procedure to have all the mercury taken out of our teeth, all of your fillings removed, you're going to be exposed, at least temporarily on an acute basis, to a huge amount of mercury vapor. And so it's a far more dangerous procedure than allowing them to stay in your mouth.

In summary, mercury exposure, as I have been able to perceive it, through ambient air and

water, does not represent a significant toxicological risk to the general population. Accidental poisoning cases in the U.S. are now rare. There was a horrible and tragic accident that occurred to a professor of chemistry some several years ago in which he was exposed to dimethylmercury which passed through the gloves that she was wearing and into her body and she developed advanced neurological symptoms and died within a short period of time. It was awfully sad, but that's a very uncommon kind of incident. By and large the exposures to people come through the consumption of fish. And there's a web site, an EPA web site that will list for you all of the different potential levels of mercury in the different fish species and you can see which ones have it.

I won't go into any details about these studies because you've heard about them. But the reason that I think the Seychellois Islands studies are more significant than the Faroes and the New Zealand studies are that in the Faroes studies, first of all you were dealing with people who were consuming large, very large fish, whales to a great extent, which have 3 parts per

million of mercury in them very frequently, so they were consuming a much higher level and had obviously higher degree of exposure. And as it was pointed out previously, many of the changes that were noted were rather subtle nuances of neuropsychological changes which I find to be somewhat suspect in a clinical kind of setting at best.

There are recommendations that have been put out by the EPA, particularly with regard to pregnant women, translating to a weekly consumption level of about 1 7-ounce can of tuna. We all know, the documented beneficial health effects from the consumption of seafood are well established for reducing the incidence of coronary artery disease. When you, when you look at people who have been consuming large amounts of fish in various different cultures, you don't really see any apparent health effects as a consequence. And there have been measurements made of individuals who have been consuming 12 fish meals a week, eating up to several pounds of fish weekly, some eating large mammals with mercury, and getting their blood mercury levels upwards of 200 micrograms without necessarily

seeing any type of symptom otology or health impairments. So my advice is – keep eating your fish. Barring an obsessive-compulsive disorder with eating it, or fishing in areas where there are advisories, where there have been fish that have over-bioaccumulated, that you're not going to have any significant problems. I've got some graphs at the end, but you can look through those in the handout. And I apologize for taking so long.

MR. FIDLER:

Thank you very much Dr. McGraw. Questions, comments for Dr. McGraw?

MR. BIDEN:

Doug Biden, Generation Association. The Agency for Toxic Substances and Disease Registry and the Food and Drug Administration, and the World Health Administration, all have recommended dosage levels for mercury that are, I guess at least 2 to 3 times that of the EPA's reference dose which -- In your opinion do you think the EPA reference dose, being as conservatively established as it is, do you think it's scaring people away from eating fish? Because every time, you know, the Center for Disease Control

comes out and says whatever the percent, 5.6 or 5.7% of women of childbearing age are above that reference dose, and then inevitably, you know, people say that that's going to put, you know, x hundreds of thousands of children at risk of birth defects. Do you think the conservative nature of the EPA reference dose is frightening people away from the helpful benefits of eating fish?

DR. MCGRAW:

Well, first of all I think it's always good to be prudent, but then I think you can be ultra-conservative, particularly when it comes to weighing a risk-benefit and there is a huge amount of benefit that is derived from eating fish and shellfish. And I do believe that that level has been set at an impractically low level and I think that in some instances, among people who read and pay attention to the news media, are perhaps being concerned about it. When I see people coming into the office and they have some concern about mercury, or the word passes their mouths in any way, there's a great deal of anxiety about it. And many of them have cut back on their fish consumption. I think it's entirely

inappropriate. We have just not been seeing any adverse consequences as a result of people who are happily consuming fish in this or other cultures and I think it is far too conservative.

MR. BIDEN:

Can I follow up?

MR. FIDLER:

Yes you may.

MR. BIDEN:

There was a recent study done in Japan where they found, I think it was based on a sample of 5,900 individuals, where they found that 86% of the population of Japan was above the EPA reference dose. And are you aware of many epidemiological studies done in Japan that have shown higher incidences of, you know, health effects as a result of the high consumption of fish in that country? I mean certainly their children have done better in standardized science and math tests than ours have. Of course that could be due to other sociological factors having nothing to do with fish consumption, but…

DR. MCGRAW:

Well I think you're correct in citing those levels and no there have not been adverse health

effects shown or associated in any way with those increased consumption levels. You always have to worry about what we've come to call a "trade off." And I think it would be an unfortunate trade off if we encouraged and persuaded large parts of the population to reduce their consumption of fish as a consequence of effects that have not been seen. Similarly, in the case of Thimerosal which was the additive used for vaccines and the huge public controversy over that and its alleged association with the development of autism in children, there hasn't been a shred of evidence to show that that's the case, and I think it's really nearly criminal that that very effective preservative has been taken out of vaccines. And what it means for the developing world where they don't have refrigeration, is that they're simply not going to get the protection from the vaccinations that they sorely need, desperately need, out of fear that is certainly not scientifically based.

MR. BIDEN:

Thank you.

MR. FIDLER:

Yes?

MR. ARNOWITT:

Myron Arnowitt with the Clean Water Action. In terms of the fish consumption trade off issue, isn't there an easy public health solution in terms of…

MR. FIDLER:

Sir, could you speak into the mike please.

MR. ARNOWITT:

I'm sorry. In terms of the fish consumption trade off issue, isn't there an easy public health solution by promoting and advising people to eat fish that are low in mercury. There are so many fish commercially available that are lower in mercury. What are the implications of that?

DR. MCGRAW:

Well I think that information is relatively widely available. On the other hand, I don't think we need to post notices in restaurants showing the mercury levels in fish because people are generally not going to go in and have a tile fish everyday or they're not going to ask for whale or they're not going to ask for swordfish every time that they eat. But, if they did have a particular fondness for it, there's just

absolutely no evidence at this particular point in time to suggest that that consumption, those consumption practices have led to any problems at all. And the beneficial results of that consumption among, what we know is a very serious ill population with coronary artery disease, and with the potential benefits there, I think it would be disastrous to begin to interfere with the consumption habits of people other than in those instances where there are some polluted waters and fish are known to have a higher level of contamination than would ordinarily be the case.

MR. ARNOWITT:

If I could just follow up real quick. Unfortunately there's a fish advisory around mercury for the entire State. But I do think that there's, when you say there is, I think that you need to think about who you're advising. Obviously a 50-year old male who's concerned about coronary artery might be different than a 25-year old woman who's pregnant. And I'm wondering if your overall statements are applied to all people and all children or fetuses, or if you feel that there's not enough evidence to make

that kind of statement.

DR. MCGRAW:

Well obviously you, you can't treat all individuals entirely as a group. And there are going to be variations among people from childhood to adulthood in any kind of situation. And pregnant women and developing fetuses are especially sensitive to a wide variety of potential toxins and we always take, we tend to take extra measures of precaution in dealing with those particular groups. But I think when you look at cultures around the world, where the consumption practices are quite different from those in the United States, and where they are in most instances increased from what they are here, again, barring some particular exposure to polluted water, and in the absence of epidemiologic studies that have shown that eating even on the extreme edges of what have traditionally been consumed in the United States of seafood, I think that there really isn't any basis for strong recommendations at this juncture. Now I think most pediatricians aren't telling their patients to stop eating seafood or obstetricians either for that matter.

MR. FIDLER:

Yes?

MS. CONNER:

I would like to ask…

MR. FIDLER:

Gail, please identify yourself.

MS. CONNER:

Gail Conner. My question is, is the children that are eating, the homogeneous group in Japan, were they eating primarily canned tuna or canned fish versus more fresh other types of fish? Whereas the number one fish consumed in the U.S. is canned which is cheaper which means that more low income people would more likely eat that in this society. Was that more canned for them?

DR. MCGRAW:

I think the consumption there is fresh fish for the most part because it's available, but they're also eating a wide variety of other fish and shellfish to a much greater extent than here. So overall the consumption patterns and potential accumulation would be far greater there than here. And even consuming canned tuna you have some selection and the least expensive variety is the chunk, it's a lot less expensive than

albacore, it has less mercury. But I've not seen any particular difference in any effects seen with either of those, or both. So I don't really think there's a concern that children or parents need to exercise other than ordinarily prudent behavior about their consumption practices.

MS. CONNER:

And the other is just a statement in regard to when you're comparing a homogeneous society that may have homogeneous types of pollutants and regulations compared to a diversified like the United States. You may have multiple environmental impact that may affect the learning abilities of a particular set of kids, particularly lead which also has an impact on children. So kids' test scores may be stronger for multiple reasons in one society compared to test scores in this society. And so I just wanted to make sure, with all the generalization going on in the media right now, that I made that clarification.

DR. MCGRAW:

Obviously a complex issue, yes.

MR. FIDLER:

Anymore, all right this will be the last one.

MR. ARWAY:

Dr. McGraw, as an angler and as a fish biologist I can appreciate and understand your observations as a physician, but they seem to be fairly black and white and I was curious to understanding that some of the fish in our rivers not only have mercury in them but also have other chemicals like PCBs and some of those other chemicals have neurological endpoint effects like mercury does. Does you position still stand regarding the lack of information and what's your position about synergisms between chemicals or additive effects?

DR. MCGRAW:

Well that's, again, those kinds of mixture questions are very difficult and I'm, the answer would be far more sophisticated than I as a practicing physician could begin to answer. As far as things like PCBs are concerned, there really has not been shown to be any significant effects from the consumption of seafood as a consequence of their contamination with PCBs. There really, I think, has been an excess amount of attention paid to that. It's there, it's ubiquitous. I've actually participated in some research work on PCBs and have yet to see

anything more significant than chloracne in individually exposed persons, namely electrical workers. But, again, I don't have any real concerns. I think most people are going to consult their wallets and their appetites and eat accordingly. I don't think we have a population that's at risk of any unusual mercury exposure through their consumption of fish products. And I think we need to be much more pragmatic and not advising them against it. Again, I've met with individuals from the CDC, from other universities, and many of them at least share my feeling and have far greater anxieties about raising unnecessary alarms about exposure than they do about the potential for harm.

MR. FIDLER:

Thank you very much Dr. McGraw. Appreciate your presentation. Where is Wick? Are you ready?

MR. HAVENS:

Yes.

MR. FIDLER:

Okay. There was a request at our last meeting for a bit of a chronology of what types of reductions we've been able to experience in various sectors under the different initiatives that have been undertaken as part of emission reduction programs under the Clean Air Act. To present information on that is Wick Havens. Wick is the Chief of our Division of Air Resources Management in our Bureau of Air Quality Management. He has a B.S. in chemical engineering from Lehigh and a Masters in environmental pollution control from Penn State. He is a registered P.E. Wick assists in much of our reg development work and is the person in charge of SIP planning within the Commonwealth. Wick.

MR. HAVENS:

Thanks Tom. I appreciate the opportunity to talk to you all. A little change in topics here. We'll go back and look at emission changes. Before we did that I thought I would show the standard two EPA slides that most of you have seen about the coming CAIR Program. Most of you know that the CAIR Program is going to lead to

some significant emission reductions. The first bar being EPA's projections of what the emissions will be in States in 2010, the second two bars being the Clear Air Interstate Rule reductions to happen in phase I and phase II. As you'll see in a minute, EPA may have somewhat mislabeled these because they call them emissions, when in fact this would be what they expect to be allowances. We see a picture for NOx, although not as substantial a reduction. The CAIR Program was set up to cover PM 2.5 and so in the future we do see NOx reductions on an annual basis.

Currently, of course, most of our NOx reductions occur on a seasonal basis and I'll show you those trends in a second. Again, throughout the Ohio River Valley, we see trends, downward trends in emissions for the future. Now if we look at SO2, and I sort of tried to put Pennsylvania in context with some neighboring States. And we go back to 1996 and you can see the decreases here in emissions in Ohio. Remember that the phase II acid rain program took place here in 2000 and so you can see the reductions coming. You can see less of a reduction here in Pennsylvania, more of a

reduction here in Tennessee, even, pretty much no change in Virginia. And of course those power plants with the highest emission rates would be those that were controlled first because it was more cost effective. And that was the whole point of the trading program. And so you can see here that we've actually had a bit of an emissions increase here recently in Pennsylvania. Just a comparison to neighboring States.

Now what I've done here is to take that same slide and add three new slides to it to show, combine that first CAIR program with what is here. And so if we look at these emission changes in Pennsylvania and now we look at where we're going to have to go, this is actually, this purple bar, are the acid rain allowance, I'm sorry, yes the acid rain allowances for Pennsylvania. And so you can see that Pennsylvania right now is consuming a good many allowances as is Ohio. There's a lot of early reduction credits that are out there for SO2 and so we are substantially above what would be a straight allocation of the acid rain allowances. Both Pennsylvania and Ohio are there and most of the neighboring States actually are not down to

the level that the acid rain program would have envisioned at this point in time. The yellow and the light blue bars are again the CAIR phase I and phase II for each of these States and so you can see for SO2 the CAIR Program focusing on PF 2.5, focusing on sulfate particulate does a very good job in bringing those levels down.

Now let's look at the banked emissions and this is to try to explain to everyone why the SO2 allowances under the acid rain program are far less than the actual emissions. And you can see here in the early years of the acid rain program, and I should say this is a cumulative, you don't add them together, each one adds on, in other words these are the new allowances added each year. And you can see here in the year 2000 when acid rain phase II kicked in, that we had the maximum amount of allowances. Again, that was part of, the idea of the program was to get early reductions and then use those reductions later on. And as you can see as we come to 2004, we are using up that bank of allowances. Of course we're still here at something like 8 million tons of SO2 allowances which is actually more than, or is about the same level as the acid rain program

is supposed to allow per year. So there's an entire one-year backlog of SO2 allowances available on the market. One of the reasons why acid rain allowances are relatively cheap although we can see an increase in the cost of the acid rain allowances now up to about $900 a ton as this bank starts to dwindle.

If we look at NOx emissions for similar years, well actually we're only going back to 2000 here, you can see a couple of interesting things here in the changes in the summertime emissions. Now I've converted from the annual acid rain program to the seasonal NOx SIP call program, a five months allowance program, to take a look at emission changes. And you can see here in Ohio the NOx SIP call kicking in 2004 and a significant reduction there. In Pennsylvania you can see that, the program was implemented here in 2003, and so you can see the reductions coming earlier there. You can also see here some of the early reductions, an application of RAC programs having emission reductions step down along the way. A similar thing shown here in West Virginia, and again Virginia looks like they're doing a lot of, more of allowance buying.

Now I've done the same thing here to show the same numbers and then add in the NOx SIP call allowances per ozone season and what the CAIR allowances will be for 2009 and 2015. And so again you can see that the NOx SIP call allowances are here and Ohio's emissions are actually here. So, again, they're using allowances from the market and here in Pennsylvania we're actually not too bad and don't have, we have some allowance importing, but not nearly as much as we do in sulphur oxides. And then the last two bars showing the changes in ozone season emissions for NOx. Again for ozone season you're not seeing a very dramatic reduction in NOx emissions from the CAIR program having it be focused on PF 2.5 and ammonium sulphate particulate matter rather than the nitrogen compounds. But again you can see some pretty significant emission reduction levels and then the continued emission reduction levels, particularly there in West Virginia. Virginia having done a little bit better here in terms of their reductions.

And if we look at the emissions bank, again, a critical factor when you look at what control

is versus what allowances are and what a budget program does. You have to remember that when somebody says these are the allowances, that's not necessarily the emissions. Again, an early bank here, about 200,000 tons in 2004. We don't have the numbers yet for 2005. Not nearly as significant, but shows there are bank emissions out there. These allowances running about $2,500-$3,000 a ton at this point in time. So, again, sort of trying to give you the idea of what the emissions look like, what the allowance programs are through these budget programs, and the, what will happen in the transition for these programs. Part of that is to try to explain the concept that some of the budget programs that you look at take a lot longer than their deadline to achieve those emission levels. And so, just as we have not achieved necessarily what our allowance would be in Pennsylvania, we're exceeding that and we're using reductions we got earlier to make up for that, that in NOx. The same thing happens in the CAIR program in the future so that you have to be aware of what the emissions are versus what the allowances are and that it takes a little time to get everybody down

to that level as you use up previous emission reductions.

Okay that was basically what I wanted to go over in terms of the NOx and SO2 progress that's been made in Pennsylvania. And since the regional pollutants looking at the nearby States. If there are any questions I'd be happy to take them.

MR. FIDLER:

Questions for Wick?

MR. SCHMIDT:

Jeff Schmidt, Sierra Club. Wick, I was looking at the SOx Emissions Select States (1996-2004) and it struck me that Pennsylvania is the only State that in 2003 and 2004 had successively higher emissions levels. Almost every other State had decreasing levels, at least over the trend. But the Pennsylvania trend appears now to be increasing and can you help me understand why we're not trending downward like the other States are?

MR. HAVENS:

I think that has to do somewhat with which power plants are called upon to produce and it also quite honestly depends upon the cost of

allowances and whether or not it's cheaper to push that scrubber to run at a higher efficiency or a lower efficiency. If the allowances are cheap enough and you don't want to push the equipment. Also in here you'll have outages where if you have a problem with a scrubber it will go down and that will increase emissions and you may have to buy allowances. You see if you look here in Ohio you see three years with an upward trend also. And so, you know, and you look here in Virginia, of course, you see, it's just sort of wafting along. It's a pretty complex market and the utility executives out there are trading off between how hard to I push this unit, how much do I run an uncontrolled unit that may cost less per kilowatt hour, and then what's the demand for electricity? You have, if you have a year where you've got a hot summer and a cold winter, then things will go up. And also remember a lot of these utilities are interstate utilities and so they may decide that they'll run a unit in Pennsylvania more than they'll run one of the units they own in West Virginia. And so all those things go into the trend. But it's pretty hard to go into that allowance system and

sort out you know why we all of a sudden had this big drop and then we started going back up.

MR. BRISINI:

Vince Brisini from Reliant Energy. Quite simply a lot of this relates to the price of natural gas. Right now the price of natural gas is such that when you bid in a unit in Pennsylvania as a wholesale generator, you bid in a price that it costs to make the electricity including the, an adder cost for allowances. That goes out into the market and competes with units, for example we have Hunterstown, combined cycle natural gas unit, and that has a price that's built on a much lower allowance adder, but it also has a much higher fuel adder. So what you're seeing right now is you're seeing coal units being called to operate because of the dispatch price as opposed to the gas fired units that maybe had been operating previous years due to a lower cost of natural gas.

MR. FIDLER:

Other questions?

MR. CLEMMER:

This is Reid Clemmer with PPL Services. I'd just like to add that, you know, it depends on the

coal market, as well, fuel supply. And for those emissions that might be increasing trend upward for those couple of years, it means that the bank that's out there of available emission allowances is being drawn down more quickly so that the endpoint will be reached more quickly in terms of when the National program everybody will be emitting at that target level plus or minus. Bear in mind that this is a National program, it's emitted over time, so early reductions that the environment and the population benefited for, you know, that's going to come and allow phase in of sources such as ourselves at PPL. We'll installing scrubbers and they'll be phased in in 2008, 2009. So this trend, you'll see that continue to go down as we prepare to meet the next phase of EPA's CAIR Rule.

MR. FIDLER:

Gene.

MR. TRISKO:

Thank you. Gene Trisko for the United Mine Workers. Wick, could we look for a moment at the slide that follows this one, the, yeah, the one looking forward. It just occurs to me that for purposes of the interests of this group, it's

this chart, above all other that you presented, that is the most relevant for our consideration. And I just note from it that it shows that Pennsylvania, under the CAIR Rule phase II, the green bar to the right, compared to the black bar of current emissions, is subject to an 80% SO2 reduction. And there's a similar reduction in a very important upwind State, Ohio…

MR. HAVENS:

Right.

MR. TRISKO:

…which would…

MR. HAVENS:

You have to mention West Virginia too.

MR. TRISKO:

…yes, and West Virginia as well. I'd just kind of like to tie this chart on SO2 to the previous discussions that we've had today and two weeks ago on the issue of "what are the benefits of going beyond EPA's Mercury Rule in terms of Pennsylvania mercury deposition" or the ultimate question that Vince Brisini raised, "what difference does it make if we simply eliminate mercury emission from Pennsylvania utilities?" And note that, for those who are concerned about

the so-called hot spot issue, or the nearby deposition effects, it is precisely this trend in projected SO2 emissions that will drive very large reductions in local deposition of divalent mercury, the kind that we heard earlier this morning is the kind that is most associated with local effects. And I want to make available to this group, I'll put it over on the table and we can all get it at lunch rather than hand it around, a pricey little handout in full color that is an excerpt from the U.S. EPA Regulatory Impact Analysis that shows the changes in mercury deposition, changes in deposition, associated with the CAIR Rule on one hand and a zero-out utility mercury strategy on the other hand. And I commend this document to your careful examination and consideration. EPA has concluded, based upon its modeling evidence, and I quote, "It can be seen in Figures 8.3 and 8.4 that the implementation of CAIR and other minor non-utility mercury emissions decreases in 2020 result in a similar reduction in total mercury deposition as completely eliminating power plant mercury emissions. The main cause of this result is that CAIR results in a very large decrease in

reactive gaseous mercury (RGM) emissions from Power Plants through the implementation of scrubber control technology." And we hope that you will take, the Department will take this evidence into careful consideration when it evaluates the potential benefits of going beyond the reduction strategy that you've described here.

MR. HAVENS:

The only thing, I would say on that is that of course that does assume that everybody does scrubbing. And that does seem to be the way things are going in Pennsylvania. But also these, again, these, you can see the difference between the allowances and the actual emissions. And so you'll see that these won't really be achieved in 2010, 2015. It'll be, it'll be stretched out as that bank of SO2 allowances is used up. EPA's looking at 2020, 2026, I think, for the emissions to fully come down.

MR. TRISKO:

I believe there will be a study presented at the next meeting that will evaluate or assess the amount of scrubber retrofits that are expected under the CAIR Rule.

MR. FIDLER:

We will make that report available. Thank you very much for providing copies. Any other comments, questions on the last presentation by Wick? Okay, we are a bit ahead of schedule. We were expecting lunch to be delivered to this room at 12:00. What I would like to do right now is break for lunch. I really believe that refreshments will be here momentarily, however, rather than resuming at 1:00, I would like to regroup if we could at 12:45. It might allow us to end the meeting a bit early today.

[Discussion about regrouping after lunch at 12:30. It was agreed to resume at 12:30.]

MR. FIDLER:

I would like to get started. Friday afternoons are usually precious to most folks and if we could get through our business a bit early I'm sure there will be no one here disappointed. I would like to next introduce Aaron Frey. Aaron is a water pollution biologist in our Water Quality Group in DEP. Much of what he does is work in assessing stream waterways and ambient water quality. He's been involved with the fish tissue program for about two years and has been I guess taking over much of the work that was done by Bob Fry who recently retired from the agency. And Bob had been involved in that program, many of you know Bob, for many, many years. Aaron thanks very much for being here.

[Delay – audio visual problem]

MR. FIDLER:

Aaron, If you'd like to get started everybody does have a copy of your presentation. Possibly Dean can boot it up. Here we go.

MR. FREY:

I'm part of the Fish Consumption Advisory Program and it's an advisory program and one thing that we do advise is we do list the benefits of eating

fish. It's usually one of the first things that we like to stress.

MR. FIDLER:

Could you move a little bit closer to the mike please?

MR. FREY:

Okay, sorry. One of the first benefits, fish are a very good source of protein, they're very low in fat so it gives you a good source of protein. Fish are a main source of long-chain omega-3 fatty acids which have really been in the health craze lately. Also, a good source of many vitamins and minerals. A lot of those vitamins and minerals are believed to help prevent cardiovascular disease. These nutrients are important for healthy fetuses and also the American Heart Association has recommended that you consume two meals a week of fish, two meals of fish per week to help prevent cardiovascular disease.

The program, it's an advisory program, we kind of set out guidelines for what we recommend people to eat. A lot of people see it almost as a warning, but I don't see it as a warning. I see it as kind of placing your hand on somebody's

shoulder, look them in the eyes, and say, you know, this is how I feel, this is what I recommend that you look at. In Pennsylvania these guidelines not only pertain to the amount of fish that you eat, but also to the preparation of the fish and the cooking and cleaning process. Our program, it starts, there's a technical workgroup that's made up of these four organizations – Department of Environmental Protection, Representatives from the Department of Health, Department of Ag, and Fish and Boat Commission. This is the workgroup that makes the decisions as for what streams to sample, recommendations to advisory listings, recommendations for even the benefits and the guidances. The technical workgroup then comes up with their recommendations. This goes up to a policy workgroup and this is made up of Deputy Secretaries from the Department of Environmental Protection and the Department of Health, the Executive Director of the Fish and Boat Commission, and representatives from the Governor's Policy Office and also the Department of Agriculture.

A little history of the program – fish

tissue sampling started in Pennsylvania in about 1976, part of an EPA study to look at levels of PCBs and organochlorine pesticides. This led to our first advisories being issued in 1976 and it was basically advising anglers to, that took fish out of the lower Schuylkill River to "only occasionally" eat species such as eel, carp, and channel catfish. This has evolved. In 1988 we started really our standardized sampling where we started looking at fillets of fish, basically the edible portion. Before that we were testing whole fish and, you know, kind of different portions. We also started rotating sampling through our Water Quality Network which is a network of stations, which they collect water quality samples, macro and vertebrate samples on like a yearly or bimonthly rotation. Fish tissue sampling is, it runs about on a 5-year rotation. Also around '88 EPA outlined a list of parameters that they look at when looking at fish tissue contaminants and this included PCBs, pesticides, and selected heavy metals. And we still use all the parameters that they outlined in that list.

UNKNOWN:

What was that list?

MR. FREY:

It was an EPA document. I'm not sure what exactly it was. In 2001 EPA and the U.S. Food and Drug Administration, they issued an advisory due to the presence of mercury. This was their "one meal a week" advisory advising pregnant and nursing mothers, women who may become pregnant, and young children to limit their consumption of sport-caught fish to one meal a week. And this was primarily due to the presence of mercury in fish tissue. This led to the State issuing a statewide one meal a week advisory for sport-caught fish. This happened in April, so a couple of months after they proposed that. The statewide advisory, it helps provide public health protection for all contaminants, not only mercury, but even those that we don't really test for, or those that we don't know much about or even the effects or even the effects of multiple contaminants. And it also helps cover concerns that anglers have about waters that haven't been tested or species that haven't been tested.

I want to run through a timeline to how our program operates. Usually April and May are, we get together, review last year's data, determine

if there's sampling that needs follow-up samples, what stations, like verification samples for possible new advisories or de-listings. Also, what stations we'll be sampling that year in the WQN, the Water Quality Network rotation. Usually in May-June we send out a suggestion for sampling locations. We ask for suggestions for locations that they'd like to collect samples of. This goes out to the DEP regional biologists, Fish and Boat Commission area managers, also the Erie Department of Health, Erie County Department of Health, they assist and they collect some samples. So usually they come back to us and they give us a list of places that they'd like to see sampled.

We'll go through, we'll prioritize the sampling, we'll get a list together, and then we usually send this list to the Department of Labs. The Department of Labs is who does all our analysis so we ask them, you know, can you handle this number of samples? So they'll come back to us and let us know how many they can sample. And then we usually provide a list of sampling points back to the regions, back to the various fishery managers, the Department of Health, and also a

copy to the Bureau of Labs for what stations we're proposing to be collected from that year. August through October is usually when the majority of the samples are collected. When samples are collected a target species is usually picked. Usually try and pick the species that's representative of a water body when that's recreationally important, so one that people actually angle for and use for consumptive purposes, species commonly taken by anglers. And we try to keep the size of the fish that we collect also be of legal size, something the anglers will take home. In trout streams, when collecting trout, we try and focus on wild trout or holdovers that are 7 inches or more. We don't collect freshly hatchery-delivered fish. Here we have, this is a list of species kind of in order of priority of what we look at when we go out to sample – bass, crappie, rock bass, redbreast sunfish, bluegill, pumpkinseed. So if bass are prevalent in the system and angled for, you know, that's kind of what we ask to have collected and so on. Channel catfish are also collected if they're in the water body and if they're recreationally important.

We collect approximately 65 samples a year. Collection is done by the DEP regional biologists; Fish and Boat Commission, the fishery managers help out; Erie County Department of Health collects samples for Erie County; the Ohio River Sanitation Commission, they do sampling on the Ohio River, although their samples are not analyzed by our lab, they do submit their data that they get for our consideration. Analysis of the fish tissue includes an analysis for PCBs, pesticides and metals. All the analysis is done by the DEP Bureau of Labs.

When we collect samples, a composite sample is usually made and it consists of 5 fish, 5 is the maximum and the recommended amount, we'll accept samples of 3 or more fish. These fish are, they're scaled, fillets are removed, the skin is left on, so the composite sample is 10 scaled fillets made from those 5 fish that were captured. Catfish such as channel catfish and bullheads, the skin are removed from those fillets so composite samples of catfish are 5 catfish making up 10 skinless fillets. Also when we do American eels, again, looking for 5 American eels and samples are 5 1-inch sections

of eels. The eels are skinned and gutted before these sections are taken.

When collecting the samples we try and get the same species of fish. This is often the case. Sometimes we'll get mixed samples of like bass, a couple large-mouth, a couple small-mouth, trout species, you know, we get composites of those. And like bluegill and pumpkinseed once in awhile. If they can't get the minimum of 3 to 5, similar species are sometimes composited, but not likely. Also fish, we use a 75% rule on the fish to keep them the same size length. So that the smallest fish needs to be at least 75% of the length of the largest fish. All fish that are used are weighed and measured before they are cleaned and gutted. Also notes are taken on the fish, general conditions, if there are tumors, lesions, fin erosions, also if there's any collection problems like bad weather or really murky water that prevented sampling and made it difficult, weather conditions.

All the instruments that are used to prepare the fillets are cleaned and purified hexane. Hexane is usually, it's labeled that it's used for pesticide analysis. The fillets are wrapped

in clean aluminum foil, dull side of the foil in contact with the fish, and then these samples are placed in plastic bags and frozen. The fillets are then delivered to our Bureau of Labs. Sample preparation and analysis usually runs October to January. In the lab the fillets are ground together, so all 5 fish, all 10 fillets are sent through a grinder. It makes a big fish patty. The fish patty is mixed up, sent back through the grinder several times so it gets a good homogenized sample. From there on I'm not sure how the whole process goes through the lab, but the lab does all the sample preparation and the analysis is conducted up there.

We issue meal specific advisories. Here's the 5 levels of advice that we issue – 1 meal a week; 2 meals a month; 1 meal per month; 6 meals per year, sometimes they say 1 meal every other month for that one; and do not eat advisories. A meal is considered a half-pound or 8-ounce portion and this is for a 150-pound person.

When looking at meal-specific advisories, these are the values that we looked at when looking for PCB concentrations. These values were developed by the Great Lakes Task Force

which was a task force from all the Great Lakes States. They got together, they were asked to come with meal specific advisories for PCBs for the Great Lakes. They asked for advisories for all contaminants, but since PCB was the major contaminant that everybody was worried about in the Great Lakes, that's the first one that they started with. So these are the values that we use – unrestricted category, 1 meal a week, 1 meal a month, 6 meals per year, and do not eat.

This is the meal-specific advisories for chlordane concentrations. This was developed by Tom Hornshaw, he's a member of the Great Lakes Task Force. He developed this, kind of on his own, it's going to be eventually part of the Great Lakes Protocol, but it hasn't been incorporated yet. Here's the meal-specific advisories for mercury. This is based off the EPA '99 Fact Sheet.

One thing that, the Great Lakes Task Force has been working on doing meal-specific advisories for mercury. It's been going on for several years now, they are almost at their final draft. They are asking for comments back on their latest draft next week and they are hoping

to have it wrapped up by the end of the year. So here I have a comparison of what the EPA Fact Sheet said and what we currently use, and this is what the Great Lakes is proposing at this point. So, as you can see, they're not including a 2 meals a month category or 6 meals per year. So when they kind of group them together, all the values that we usually see in this range 2 meals per month, they have groups down in the 1 meal per month. So if we go this route it will kind of become a little bit more restrictive in consumption advisories. This is something that we have, we have a discussion going on next week for the Technical Committee to discuss this draft and if we're going to, and possibly if we're going to look at adding that into our protocols. Also, we use the FDA action limits when looking at other pesticides.

When issuing fish advisories we usually like a minimum of 2 samples. These samples are usually, we like to keep them fairly close in timeframe, like within 10 years, within 5 years. Sometimes we'll look at a composite of more than 2 samples, but we need a minimum of 2 samples that have similar or the same consumption

advisory criteria. However, if a sample comes out with high concentrations that issue a do not eat advisory, that's all it takes. We only need 1 sample for a do not eat advisory to go into effect.

So currently we have 197 specific advisories -- those are meal-specific, waterbody-specific, species-specific. This covers a total of 114 waterbodies and 30 lakes. And also, as I said before, Pennsylvania does have a statewide 1 meal a week advisory on sport fish.

This is a breakdown of advisories. For mercury we have advisories on 877 miles of streams. This includes 28 lakes which is about 28, or over 28,000 acres. PCBs, we have advisories on over 1,000 miles of streams and 2 lakes which are about 3,300 acres.

I went through and I looked at, I quickly looked at the mercury this morning. We currently have, there are 76 advisories issued for mercury. 60 of those fall under 2 meals per month and 16 of those fall under 1 meal a month. So we don't have anymore restrictive advisories due to mercury in place. We have 316 miles of streams advisories for chlordane and 36 miles of streams

for dioxin. I think all of those dioxin miles are lumped in with chlordane. So if you see, our advisory lists chlordane/dioxin which will come up here. This is a map showing statewide where we have our advisories. This is not up-to-date with the most latest advisories that are in place. It also doesn't include any of our lakes. These are just streams. Mercury is in green, all the slightly darker lines; PCBs are orange, so a lot of it's down in here; the chlordane advisories are out in the Pittsburgh area.

MR. FIDLER:

Aaron, excuse me just a second. I apologize, I need to run off to a meeting, but I'd just like to put a place holder on a question that I have. You presented different numbers for, recommended for the Great Lakes and also for, basically numbers generated by EPA. And you indicated that a committee was going to be meeting in about a week. The question is, if in fact the more conservative numbers for mercury, at least for the one advisory of 1 meal a week, is adopted, is the committee thinking about applying that statewide or within the Great Lakes Basin or just what? That's one question. And then just maybe

if you could provide some information as to what the basis is for the difference in EPA numbers versus numbers developed by this Great Lake's group. And that doesn't, just finish your presentation and get back to that. I just need to run. Thank you.

MR. FREY:

Someone bring them up later so I don't forget. Also our advisories not only cover, you know, the amount of fish to eat, it also deals with the cleaning and cooking of the fish. Our consumption advice it pertains to skinned and trimmed fish. This is to limit exposure to contaminants like PCBs which are found in the fattier portions of the fish. Mercury, as it's in the fish, the muscle, it can't be reduced by actually cooking and cleaning of the fish. This is what we recommend the portions being removed when you're cleaning a fish. We recommend they remove all the skin off the fillets, remove the dark, fatty tissue along the sides of the fillets, the belly meat, and also the, usually a fatty portion that runs along the back of the fish. So we recommend all those portions be removed before cleaning. We recommend that the

fish be baked or broiled on a rack so that any of the drippings drip away removing the fat and the majority of the PCBs. And then to discard any of those drippings, not to use them in sauces or cooking any other foods.

Another very important part of the advisory program is the outreach to get it out to the public. It's a difficult ordeal. Usually in November we issue a press release, sending out updates on the next year's advisory list. We're hoping to get that out next month. We try to get it out in November because in December the advisories are also listed in the regulation booklet for the Fish and Boat Commission and that usually comes out in December. So that will be coming out in two months. Also, the advisory list is posted both on the DEP website and Fish and Boat Commission. It also includes contact information, phone numbers, website. On our DEP page there's also video showing proper cleaning and cooking techniques of fillets. Also here in DPA we have, DEP we have a fact sheet that's available on fish consumption. That's the end of the presentation.

MS. EPPS:

Thank you Aaron. Could you start by addressing the questions posed by Tom Fidler? The fist question pertained to the differences between the EPA numbers and the Great Lakes Protocol.

MR. FREY:

I believe the EPA numbers, I believe the numbers from the Great Lakes Protocol includes a lot of the more recent studies, a lot of the, the Faroes Islands studies and the Seychelles I think are updated in those numbers compared to the '99 EPA values. What was the second question?

MS. EPPS:

The second question pertained to what is the purpose of your meeting, your technical workgroup meeting, what's the outcome? You're going to be discussing the Great Lakes Protocol to decide whether you want to adopt those particular levels or not.

MR. FREY:

The meeting next week I, we probably won't make the decision to accept or not accept their values yet. They're still asking for input on their draft to, they're trying to finalize their draft. Once their draft is finalized, we can agree as a State to the protocols, but also as a State we

can, even if we do agree to their protocols, we do not have to agree to use their values in decision making.

MS. EPPS:

Thank you.

MR. CANNON:

David Cannon, Allegheny Energy. Aaron could you go back to the map of the State for a moment? I guess my first question is sort of a personal one. For those of us who are colorblind, is that available just for each specific component, where I can't distinguish between green and orange?

MR. FREY:

I could, but I can't in Power Point.

MR. CANNON:

Maybe I can talk to you about that. I guess my question is, "Are you aware of any work, or have you done any work, that would try to focus on some of these concentrations in the fish and tie them back to sources, industrial or otherwise?"

MR. FREY:

I haven't done, I think Air Quality has, our mercury data, they might have been looking at that a little bit. But I don't know.

MR. CANNON:

Does anyone in Air Quality know?

MR. CANNON:

Has there been any attempt to correlate the fish results here with sources, industrial, mining, otherwise?

MS. EPPS:

Krishnan Ramamurthy, are you guys taking a look at that?

MR. RAMAMURTHY:

Yes, we are trying to really map it and then I think the project is (inaudible). I think we have fish data. (inaudible) the departmental (inaudible) higher concentration fish level [NOTE: Mr. Ramamurthy was not a microphone until asked to move to one as shown further in the transcript.]

MR. CANNON:

I'm sorry, did you say modeling data versus…

MR. RAMAMURTHY:

Mapping, it just goes through all locations. (inaudible) concentration (inaudible) it will give you better idea of where the highest mercury concentrations (inaudible).

MR. CANNON:

Would this be, are you just looking at the

concentration of the fish or are you actually putting it against electricity generating units or are you just looking at industrial sources in general or just the concentrations at this point?

MR. RAMAMURTHY:

Just the concentrations (inaudible). Basically we are just mapping the fish, the mercury concentrations in fish and then overlaying the power plant locations. Then I think the next phase will be the modeling of (inaudible). The object of the other project is to map the mercury concentrations in fish along with the power plant location.

MR. CANNON:

Will there be consideration given to other industrial sources, especially in some of the areas that going to have a concentration and, you know, incinerators or other…

MR. RAMAMURTHY:

I think, yes, that's… we could add that I think that (inaudible) most of the (inaudible) will be controlled now. (inaudible) we can add the municipal and (inaudible).

MS. EPPS:

Gene?

MR. TRISKO:

Joyce thank you. Could I follow up on that, Gene Trisko for the United Mine Workers. Will you be considering in your mapping, in your mapping, and you mentioned an overlay of utility sources, will you be considering the contributions of utility sources in other States? Will you be considering the concentration of industrial sources in other States in this overlay that you've described?

MR. RAMAMURTHY:

Yes, this is a physical map and you’re not talking about the contributions coming from the other States. But I think you could, I don't know whether we have the data, we could really look at the nearby power plants, the neighboring power plants at least to the border, particularly in western PA. We could identify them and do a, but you’re talking about just an approximation of between the plant and the high concentration in fish not any modeling or any modification of the effects.

MR. TRISKO:

If I might, let me suggest to you that I, for example, have U.S. EPA's data file of mercury industrial sources within and outside of

Pennsylvania correlated to their deposition in Pennsylvania. And that's a list of approximately 140 or 160 industrial sources and the same data are available from U.S. EPA; which has done this model for electrical utility sources throughout the eastern United States, before and after the Mercury Rule. And that you might, you might better rely on EPA's deposition analyses than developing a spatial tool that would tend to create a source contribution relationship where there may not be one, or it could be misunderstood. These issues have been modeled with considerable, well within the limits of modeling science, and EPA is in possession of data. If you give me your card I'll be happy to email you, to email the file from EPA on industrial sources in Pennsylvania and elsewhere. And that might give you a good starting point for this exercise.

MR. RAMAMURTHY:

I think that…

MS. EPPS:

Krish, could you move up to the mic please?

MR. RAMAMURTHY:

Again, there's a lot of assumptions made on the

speciation data. I think it's very, I think you've got to understand, in fact for Pennsylvania basically EPA's speciation data uses only one or two facilities –- the Bruce Mansfield (phonetic) and then the Scrubb Grass (phonetic), are the one or two facilities they tested with the speciated data. A lot of the other facilities, they are making gross assumptions excerpting from other facilities and I think that's one of the major limitations of that thinking. Once we have more site-specific speciated data that will tell a different picture.

MS. EPPS:

John. Identify yourself please.

MR. SLADE:

Yes, this is John Slade. I wanted to add to what Krish was saying. I mean I think people need to be careful, the Pennsylvania fish data was not collected with the concept that we were going to do an industrial or utility correlation between the fish tissue data and the emissions so we, we certainly, we don't have the resources available, we don't have the speciation data as Krish said, to do what Dr. Sullivan's going to talk about in

the Brookhaven Report. And I think maybe he can shed some light on the difficulty what I hear people asking us to do here. That's a very difficult task to do, especially when we're just collecting data here and there that was not intended to be correlated in this type of a detailed analysis. So, you know, we are going to look at the available data, but I think to expect to draw the sort of correlations and the information as is presented in the Brookhaven Report where you go about this whole process with modeling, with speciation data, with fish tissue collected specifically for a study around a power plant, I wouldn't want to get your hopes and anticipation up that we're going to be able to do that quality of an analysis with what we have.

MR. WELSH:

Mike Welsh, the IBEW. Just a question on your sample collection. It says you have 65 samples per year. Is that 65 of each species, 65 locations, what does that mean?

MR. FREY:

It's 65 samples that, composite samples, that are submitted to the lab is basically what it is. It could be multiple samples from one location, like

usually, usually it's just one sample from a location. So it's usually about, you know, pretty close to that number of locations.

MR. WELSH:

So 65 fish of different species throughout the whole year?

MR. FREY:

Yes.

MR. BRISINI:

Vince Brisini, Reliant Energy. Has there been any work done at all to, to determine what effect an acid mine drainage tributary has relative to a stream that, you know, through the dilution effect then further downstream supports the aquatic life? I'm just curious, it seems to me that you, you know, you have an acid mine drainage stream, it's a tributary. I can think of places down on the Allegheny where we fish for walleyes where you actually have the iron lock falling out of the, you know, depositing in the, in the stream. I'm just curious, does that seem to have any effect at all relative to the fish advisories in certain areas or the concentrations, has there been any correlation?

MR. FREY:

I don't think I can answer your question. I don't think I have the background to answer that.

MS. EPPS:

Jeff.

MR. SCHMIDT:

Thank you, Jeff Schmidt, Sierra Club. You made several references to sampling the focus on recreationally important fish. How does that correlate with fish that, subsistence fishing, which is not necessarily a recreational activity, but it's the way people acquire their food? Is it, are they, does the Commission do you know if the Commission, or if you guys consider that to be the same?

MR. FREY:

I believe so. I don't know of much subsistence fishing going on in Pennsylvania. I imagine most of those species would be commonly angled-for species.

MR. SCHMIDT:

What I mean by subsistence, and there may be some legal definition, but, for instance, here, within the city limits of Harrisburg, I have seen often times elderly folks, obviously not upscale, perhaps walking over from some project areas in

uptown Harrisburg, fishing, very frequently. Those people are taking their fish back and eating them. And they're eating them probably, as opposed to buying fish at the market frequently. I would think of those as, you know, people not necessarily doing it for their recreational enjoyment, certainly I do, but I would think of that as more on the subsistence, you know, involvement.

MR. FREY:

I think if there's an issue, if there's a concern, that they are to be brought up when the Fish and Boat Commission and the regions submit where they would like to sample and what species they'd like to sample. If they're aware, you know, that people are taking a whole bunch of carp from right downtown, that they'd recommend, you know, we sample them and take a look at it.

MS. EPPS:

Myron.

MR. ARNOWITT:

Myron Arnowitt, Clean Water Action. I'd just kind of, on the same lines because I've certainly seen that kind of subsistence fishing in the Pittsburgh area as well, has I believe he or the

Fish and Boat Commission gathered data on how much Pennsylvania fish is consumed and kind of as a side part of that question I was wondering about is there any commercial sale of fish that are from Pennsylvania?

MR. FREY:

I don't know. John, can you answer those questions better?

MR. ARWAY:

I didn't catch the first part of your question. Regard to commercial sale, there's no commercial fisheries. There's, I think we might have one trout there left on Lake Erie, but we bought out the commercial gill netters on Lake Erie and there isn't anymore commercial gill netting on Lake Erie, so there's virtually no commercial fishing left in Pennsylvania.

MR. ARNOWITT:

The first part was just is there, are there numbers, data on how much fish in Pennsylvania is consumed?

MR. ARWAY:

I don't know of any studies that may have done that. In terms of estimating the number of fish that are consumed by recreational anglers anyway.

But just to touch on Jeff's question about subsistence fishermen, Seagrants (phonetic) recently funded the study with Drexel on Asian populations near Philadelphia. In trying to reach them through different modes of communication, they have separate radio stations, separate tv stations, they are actually going to be putting out some posters in their languages to try to reach out to that culture to try to get this information out to them. So we do identify areas like that where we have recreational anglers taking large amounts of fish in areas that we know may be subject to certain levels of advisories. For example, here in Harrisburg, we don't have targeted advisories for example on small-mouth bass in the river so we wouldn’t reach out to the small-mouth bass anglers on the Susquehanna with advisory information. But in unique situations like in Philadelphia or if we identify in Pittsburgh, we also, Seagrant's also doing that along the docks in Erie. They're putting up posters in different languages to try to get this information out to different cultures.

MS. EPPS:

Reid.

MR. CLEMMER:

Reid Clemmer with PPL. I was just curious if you've done any mapping, not mapping but rather just data trending, with, to show, trying to study what's happening with fish advisories over time?

MR. FREY:

I haven't done any. It probably would be hard to look at number of advisories because we keep sampling more areas and different areas. So obviously you're going to eventually come up with more advisories. I don't know, being that the program, you know, it's not 50 years old or something, how good of a trend we'd be able to see.

MR. GRAYBILL:

Lowell Graybill with the Pennsylvania Federation of Sportsmen's Clubs. This kind of encompasses a couple things that we've been hearing about the sampling and I just want to be clear on this for myself. You were talking about 65 samples a year and your sample group was by fish, 10 fillets as I understood it. So we're talking 325 fish. Out of that 325 fish, how many of those samples are

coming from areas that were previously tested and already have advisories on them versus samples that are coming from areas suspected or being proposed by the agency or, I'm wondering, kind of get an idea of what we're looking at as far as not only continual monitoring, but what we're seeing as far as a trend in increasing numbers of streams, I mean, a little bit along the line of the last question, but the increasing problem areas, or at least suspected problem areas?

MR. FREY:

Well, in our sampling we have approximately 65 samples a year. Each sample is a composite of 5 fish, so it's, you know, it's all one sample, so it's not 300 and some samples, so it's only 65. I don't know exact numbers of what are repeats and what are new. I'd probably say 80% repeats, 20% new. It just depends, a lot of the new stations are where the regional biologists, you know, suspect hey let's look here. Most of them are re-samples.

MR. GRAYBILL:

And does, do you re-sample automatically then in areas that have advisories on them? Or what kind of a process is there to monitor that ongoing

once it hits an advisory list, then what's the process from there?

MR. FREY:

There, we don't have a comeback year for samples that have advisories, the WQN stations, they're tried to get back to every 5 years whether there's an advisory or not, you know, just for monitoring purposes. But other stations that have advisories that are not in the Network, I don't, we don't have a set protocol to go back, you know, every 5 years or 10 years.

MR. GRAYBILL:

Okay. Thank you.

MS. EPPS:

Are there any other questions for Aaron? If not, thank you Aaron. The next item on the agenda will be presented by Dr. Terrence Sullivan. Dr. Sullivan is the Deputy Division Head of the Environmental Research and Technology Division at Brookhaven National Laboratory. He joined BNI in 1983 and has primary research interest in the application and development of models for air, soil, and groundwater contamination problems and assessing human health risk. He's also developed, for the Nuclear Regulatory Commission, six different computer models that have gained international acceptance. He's been the principal investigator for programs involving risk analysis, deposition modeling, data collection, and risk analysis for mercury emitted from coal-fired power plants, and risk analysis for mercury contamination in river sediments. Dr. Sullivan's other research interests include the use of, the use of decision support software to assist in defining clean-up goals in environmental remediation problems and the use of gas tracers to define flow patterns in urban settings. He's authored more than 100

publications. Dr. Sullivan.

DR. SULLIVAN:

Thank you. First I'd like to thank you for inviting me here today to speak. I think this is a very important topic and I'm glad that I could be here today.

As a little bit of background, at Brookhaven we've been working on mercury risks from coal-fired power plants for about 10 years. We've been sponsored by the Department of Energy and I was instructed to tell you that these opinions are not of the Department of Energy – they don't take any official position and so on. But, these are the results of our research findings over this period. And more particular, over the last five years or so are what I'll talk about today. We've done a lot with looking at health risks for mercury, deposition modeling, looking at soil and vegetation concentrations, and human health risks. Today we'll talk about local deposition, our work on that, and our human health risk work we've also done in this field.

So the first question is hot spots. I've got a list of quotes up here from a number of people after, when they came out with the Clean

Air Mercury Rule in March, there was a lot of concern about hot spots. One was from someone on the EPA's Science Advisory Board, another was from the DEP Commissioner from New Jersey. I could find similar quotes from Pennsylvania, Illinois, New York, whatever. I kind of picked New Jersey because they were leading the lawsuit. Now there's a lawsuit filed by 14 States and a number of environmental groups and one of their concerns is the issue of hotspots. And that's something that we've worked on for the last 3 or 4 years in this program.

So what is a hot spot? It's a spatially large area that's much above background that you wouldn't expect to see somewhere, is the general term people use. For this particular work I'm going to use a more statistical definition which is something that's 2 to 3 times the standard deviation above, 2 or 3 standard deviations above the mean. So it kind of says, okay, this is something we would not expect to be there naturally. And then EPA has their own definition – a utility hot spot is a water body with methylmercury fish tissue concentrations greater than .3 milligram per kilogram attributable

solely to the utility. That definition is geared because health risks are related to the fish concentrations and so on. It's, this is a difficult measure to make because that assumes you have a before and after measurement which we just don't have. We can look at it from the perspective of are they higher than other water bodies in the area and things like that, but we don't have the data, we don't have the respective data from before these plants went in.

So, do coal-fired power plants produce hot spots, is the big question. In this particular study we looked at three different coal-fired power plants. We looked at, we did mercury deposition modeling similar to what EPA did in their report to Congress. To get a background of what we'd expect to see, high concentrations, how high should they be, how much extra deposition should we see in there, and also to see if the deposition matched the concentration gradients. If so, that'll give us some inkling that there was in fact a strong influence by the power plant. So for our particular work, we defined it as a region in excess of 5 square kilometers in which the concentrations are more than 2 standard

deviations above the mean. So we're looking not just for one high sample, which you're going to have. In any set of environmental samples you'll see a range of values whether it's fish concentration of mercury, or mercury in soils, or PCBs or whatever. That's just the nature of environmental contamination.

So we did deposition modeling for these three plants, Plant A which didn't want to be named, it emitted about 366 kilograms of mercury per year from this station. Of that, about 61 kilograms per year is RGM, reactive gaseous mercury. As we heard earlier today, reactive gaseous mercury is really the one that deposits, it's got fairly high solubility in water so when it rains, it pours. The other types of mercury, a particulate mercury, comes out of a power plant, but with most of the emission controls on coal-fired power plants, that's almost always less than 1% of the total mercury content. So we don't see a whole lot of particulate matter coming out of the stacks. And the other is elemental mercury. The other plant, Kincaid Power Plant, is near Springfield, Illinois. It had 161 kilograms of mercury total, 32 of

reactive gaseous mercury. That site was selected for this study because they did a similar study back in the '70's where they looked at soil and fish concentrations and so on. I'll touch on that a little bit as we go through this today. The third plant was the Monticello Plant in Texas. It almost puts out, almost a 1,000 kilograms per year of mercury and a large amount of reactive gaseous mercury. It's one of the top 5 plants in the country for mercury emissions every year. And these last two plants are adjacent to State Parks with big lakes on them and they had water bodies so we kind of wanted to look at plants that were near areas that people would actually go to fish. So that was part of the motivation for choosing these plants here. Then we each finally took the local meteorology data for an hourly basis, plant specific speciation, and release data -- how high was the stack, what was the exit velocity, stack temperature -- those types of things that impact upon the buoyancy of the plume and later the deposition. So that's what we did there.

So in general here, I'm trying to go, move through a lot of data with you fairly quickly.

So, you know, please, if you have questions at the end, bring them up.

We found the wet deposition of reactive gaseous mercury dominated the deposition patterns. You would see very little elemental mercury deposit locally. When I'm talking locally, I mean on a, near, very near the plant, 10 mile basis from there, because that's about how far we went in our studies. Dry deposition, predicted peaks, tens of kilometers from the plant, so you do get a dry deposition component. But that's much less than the wet deposition. And again, the dry deposition is primarily reactive gaseous mercury is depositing under dry conditions at a distance, but again, at a much lower rate than under the wet conditions.

Two maps here, and actually I've got these slides a little bit out of order, but I'll come back to it later. Here's the deposition on the Kincaid plant. The scale here, green is less than 1, blue is 5, and above the red in here is above 10 micrograms per square meter per year. Background wet deposition at the nearest mercury deposition network station which was about 60 miles away, was about 10 micrograms per square

meter per year. So we're seeing a prediction of a very small zone, a few kilometers, that we might double background concentrations, and a big zone, this is maybe 30 kilometers, where you, this is only about 5% of background deposition. So when you get out here, you really wouldn't be expecting to see much because just the natural variability and so on, it would be very hard to trace an effect from a power plant at these distances.

Here is the Monticello Plant. We've done the scales the same, micrograms per square meter per year. Here the 10 is the doubling of what would be the wet deposition background. They also had a mercury deposition station about 50-70 miles away. So you get a much bigger signal, predicted signal here, from this plant. This is the one that had the very high mercury and it also had a high fraction of reactive gaseous mercury, remember it was putting out 500 kilograms per year of reactive gaseous mercury. So this one is predicted to have a very strong signal compared to what you'd expect to see from background.

That's why I said it's a little bit out of

order here. Here is the mercury deposition network area here. It shows the deposition patterns throughout the United States. The Monticello Plant is down around here, the Kincaid Plant is right around here, and I highlight this little section here in southern Indiana, there is a plant called Clifty Creek which has a mercury deposition station near them and I'll talk about that later. As you can see, you do see a little bit higher deposition here than, around it, than the rest of the State. And I'm going to discuss that.

So we did our sampling. We went out to the field and collected soil and vegetation samples from each of these sites. We did it based on deposition modeling to start with and then later on, I'll show you, we just basically did a ring around the whole site. We did kind of pick some of our spots where we expected to see higher deposition to see if we could see these effects. At each location we took 3 surface samples. We wanted to look at the variability, so we went 10 feet in one direction, 10 fee in the other direction. They took a surface sample, top 2 inches, so we cut off the vegetation growing,

just took the soil. We also took 1 what we call "deep sample" which is from a 2" to 4" horizon. We were trying to see, if this was an atmospheric process it should be much less or lower as you go down. It is known as you go down in depth that the mercury concentration generally decreases at most locations. And one vegetation sample. We wanted to see if we saw big increases in the vegetation and how that differed from the soil and see if we could see a pattern from that as well.

Here's a sample design around the Monticello site. This is the lake I was talking about, the plant's down in here, 10 mile radius, we kind of went out in all directions and got roughly about 100 samples from there.

Here's the same idea from the Kincaid Plant. The Plant is here, here's the body of lake here, the winds in both these plants were from the south direction primarily. So, again, we got about 100 samples in this area here.

What we did then was we took these samples and shipped them back to Brookhaven. And these sampling campaigns were done over a 3-year period. I don't want you to believe we all did

this in a few months, it took awhile. And analyzed it on the mercury analyzer which is up here. We could detect down to about 1 part per billion, as you'll see, our soil concentrations generally are around 20 or 30 parts per billion on average, so we had pretty good detection capabilities there. All samples were analyzed in triplicate. So not only did we have 3 samples, we analyzed each of those 3 samples 3 times. So for each spot when I'm reporting a value, it's the average of 9 samples. We did this to try to get away from just natural variability and getting something that just popped up on us. We did see about a 20% variability between samples from the same spot and about a 20% between the three samples as you went across there. We also had 10% NIST standards to make sure our machine was working and 10% blanks and 10% blind duplicates. So those are our quality control measures. And here's an example of our NIST standards. We got 1 out outlier and rest were what we'd expect them to be. So we feel that the data quality is good.

What I'm going to do now is talk about all 3 plants. I'm going to talk about 1 aspect at each

plant, but they are, the same results basically are accredited to all 3 plants.

Here's Plant A, median was about 27, standard deviation was 7, quite tight distribution, maximum of only 55. Kind of looks like a normal distribution you see from a soil. We're not seeing a lot of evidence of hot spots. We would see a lot, up here at this high end, a lot of samples up there. This is only 55 samples, this is our smallest sample group. Here is the map here, this is with the deposition map, so this is the color map of deposition. This is at 3 micro-amp per meter squared and this is at 5 micro-amp per meter squared, background at this site was probably about 7 or 8 micro-amp per meter squared wet deposition so this is roughly half or two-thirds. And so we'd expect to see a strong correlation here, and what we've got here is the soil data, on each of the following graphs you'll have the same type of presentation, we've got, being in the three groups, roughly equal size, sometimes it's four groups, but again, it's equal size in terms of the samples. So we have the one group that's under 25, the median group 25 to 29 showing it's very tightly sampled around

that 25 to 29, a third of the samples fall in that range, and then 29 to 55 was the high group. So you'd expect the black triangles, the high group, to be near the plant, and sometimes they are and sometimes they aren't. We'd expect the low ones, the green ones, to be away from the plant, a few ones close, but primarily away. So there may be something there, but it clearly doesn't match the deposition pattern and the intermediate diamonds a lot of them in here too. This basically went up to about 5 miles or 8 kilometers and about .5% of total plant emissions were deposited within this region based on a number of things, modeling as well as the data we had here if you compared it to some background type of information and so on.

Here's just a coloration of the deposition versus the measured concentration. As you can see there's no real correlation. Again, I'm not going to be able to show you this same graph on all three, but at the other sites the same type of effect occurred. We did not see a strong correlation with deposition and soil concentrations.

Here's the Kincaid site. Median about the

same, wider standard deviation, see a few more at the high end here, but again we don’t see a cluster up here which you'd expect to see. There was a strong correlation between the surface and the deep samples. Here's the graph of that. The surface and the surface, and the concentrations for the surface and deep. But they're exactly the same they lie on one another, but you can see the, the low values are all low and the high values are all pretty high so we were getting a good comparison between those two.

And here are the results here, here is the deposition map, I broke it out here. So 5, this area right down in here is 10, so that's doubling back on deposition. So you'd expect to see high values in here. We do see some, we also see some low values. The green is the lowest and the black is the highest. We don't see a strong correlation with what we'd expect to see here. What we see is we see a correlation going east west of this particular plant and we put that on the map here, that happens to be the main road. The power plant is here, in here, and this road goes to the interstate and it's where all the plant traffic is. There's two towns here. The

rest were farm roads and very low traffic. There have been reports in the literature to say something about the traffic emissions causes the mercury to react and become reactive from elemental and deposit. It's very speculative. I don't know if that's happening or not, but that's one reason they say it's often sometimes higher in urban settings, the mercury levels. But it is clear here, we tried to get background samples of this site and of course we picked heavily traveled roads so they look like these values here, they were above our average. So, again, more anecdotal information I'll say, that suggests that it might have to do with the traffic patterns as well as the deposition.

Here's the Monticello site. This is the biggest release. It had the highest average, but again, fairly similar. A bigger standard deviation, more spread in the data here. And that, we'll talk about that later, why we think that happened, maximum about 111, minimum 76. And we are seeing some more at the high end.

Here is the maps. A little bit difficult to follow here. That data here is like the symbols, black being the highest and this purple being the

lowest. And then, I've got two, blurry vision here, I think piled too many images on here, anyhow, here's the deposition map of this region. This region should be a doubling effect on deposition, this region should be, I mean 3 times, this should be 2 times background deposition. So we should see a strong pattern at this site. We really don't. And then the same with soil vegetation. It's actually clearer, we saw similar patterns here. We saw the soil and the vegetation is the, had very strong correlation with being near the lake. And that had to do with the soil type was a little bit different. It was higher in organic matter. It was, tended to be a little moister and brown in color. And when we went to some of the other places we got, at this particular site we got a very big range of different types of soil, from very dry, sandy soil to more, soils with high organic matter. What we did here was basically the same thing. The soils, even if they were away from here, like this one had a lot of the organic matter and it had a high value here. So we think it was more an odd effect of soil concentration at this site than of deposition

because we should have seen a strong deposition pattern more south like this, and we really didn't. We saw, again, more, it was a function of distance from the lake.

So, in summary, for the local deposition there's no correlation between predicted deposition and soil/vegetation concentrations. There's strong agreements between the deep and the surface soil samples. So again, it's saying soil type is an important parameter which was consistent there. Then we took a look at the high values, because we had values up to 100 when the mean was 30 or whatever, if we averaged them with their nearest neighbors then that average was within 15-20% of the median. So we were not getting 100 to 100 to 100 all clustered together, we got 100 here, 60 there, 80 here, and if you looked at their nearest neighbors, then they were higher than average, but 20% higher. So not a strong signal there either. In all of them we suggested, up to about a 10 mile radius, about less than 2% depositing close to the plant, of the mercury emissions. So we're not seeing a large fraction, but we believe there's some.

What I'm going to talk about now is, switch

gears a little bit, and talk about some of the other work we've done and that has to do with risk assessment.

MS. EPPS:

Yes Charlie?

MR. MCPHEDRAN:

I'd like to ask a question before we go on.

DR. SULLIVAN:

Please.

MR. MCPHEDRAN:

I'm Charlie McPhedran with Penn Future and I'm interested in your choice of background, or your definition of hot spots is the first piece. You did not use the EPA definition, is that right?

DR. SULLIVAN:

No, because we did not measure the fish, you have to measure the fish concentrations and so we, we were trying to look at something that's 2 to 3 times the median, so, you know, it’s 30 plus the standard deviation was 15, we're, if you see something above the 70 level in a cluster we would say that would constitute a hot spot because we wouldn't expect to see that naturally.

MR. MCPHEDRAN:

So when you, when you use a soil definition…

DR. SULLIVAN:

Right.

MR. MCPHEDRAN:

…instead, do you, I assume that some of these areas might have multiple plants, Monticello might have multiple plants.

DR. SULLIVAN:

Yes, it has 5 units there, yes.

MR. MCPHEDRAN:

So couldn't there be an elevated background level on an area like that? Did you make any effort to find clean soil that was not impacted…

DR. SULLIVAN:

We did, we did at Monticello and we did at all these places. But the first two, the first plant we, the background numbers we got, which we, background we generally went 15-20 miles away from the direction of the wind, you know, so if the wind's north/south, we went east or west. And grabbed background samples. At the first site the background samples were the same as our average samples there. We took about 5 to 8 background samples at each location. At the second site they were actually higher than our median value, and again, we suspect that was

because it was heavily traveled roads, we don't know why.

MR. MCPHEDRAN:

Or it could be impacted by other utility or industrial combustion?

DR. SULLIVAN:

There were no other utility or industrial where we took the background there. The industrial I'm not 100% sure of, but there's clearly not a utility in this area. At the Monticello Plant there is actually another plant to the east of there, so we went to the west there and took our background samples. We had one at the very edge of the lake which looked like the others at the edge of the lake and then the other ones had different soil characteristics and they were lower than our median. But they were consistent with the other soils, same soil type if you will. So we looked for background, but we, we couldn't get anything that we could hang our hat on. We could say that at Monticello it looks like it's lower, but it's compounded by the soil type issue. And at the others, you know, one was higher and one was the same, so it's, it, it looked more like a regional value and a soil type

value than, than a strong signal from the plant.

MR. MCPHEDRAN:

I guess one of the policy issues we'll get to in a minute, but it relates to this is, a hot spot doesn't have to be one plant. When you're looking at a place like western Pennsylvania, a hot spot could be multiple plants impacting an area and it looks like EPA's definition encompasses one plant, it focuses on one plant, attributed to one plant. And I wanted to make sure that the hot spot, the hot spot from several plants isn't lost in the shuffle.

DR. SULLIVAN:

Okay. When you all, recognize, when I'm talking a hot spot, about a hot spot, I'm looking within 5 or 10 miles from the plant. And we'll talk a little bit more about that later. So I mean unless these plants are adjacent, I mean Monticello, by the plant I mean the 5 units that are running there, and those plants they have 2 or 3 units. So it's whatever's going out from that particular site and they're separated by 400 meters or however far the stacks are. Sometimes they have multiple stacks and they all come out pretty much the same spot. But the, so from my

perspective, I'm not looking at what I'll call more or less a regional issue, greater than 10 miles, how they impact on one another, but if you saw it from a deposition modeling, once you got out past 10 miles, with the exception of the Monticello Plant which had very, very high mercury, you were at 10% of background as a model deposition. So, given 10% of background, you have 2 or 3 plants, then it depends on how they contribute. So you might get 20%. Let's say at 2 plants that are 20 miles apart, and you know, when the wind's blowing this direction from this plant and this direction in from that plant, so it certainly could be a cumulative effect at a further distance. But at the distances we're looking at there just, I mean there are no other power plants within our sampling radius so we knew that there was no impact in that region, I mean we didn't expect a strong impact in that region from other plants.

MS. EPPS:

Jeff.

MR. SCHMIDT:

It's our understanding that the Monticello plant has at least 3 large power plants within 50 miles

of it.

DR. SULLIVAN:

Yes.

MR. SCHMIDT:

And it would seem to me that if you have a plant that has 3 other large plants around it, trying to go outside the 10 mile range to get a background level, that background level is probably going to be affected by the other power plants in the area and wouldn't it make more sense to be looking at the plants that are isolated and not near any other plants at all and then comparing that to the background levels in a pristine area nearby, you know, outside of the 10, 15, 20 mile radius of the plant being tested.

DR. SULLIVAN:

In a perfect world, yes. I mean, the plants tend to be clustered in certain areas. In Texas they're all clustered there because of the lignite that they mine from that area, and so on. And along here, in Ohio, they're along the Ohio River, okay. So if you could do that, yes, that would be the way to do it. There have been studies at 4 Corners in New Mexico in the '70's and they did not see a strong signal there. And

that's pretty isolated. So if you could do that, yes. And, again, this goes back to what the deposition modeling says – there are uncertainties and you can argue or disagree or whatever, but the point is, deposition modeling says that you are only going to be at 10% of background after 10 or 15 miles. So if you're 30 miles away, you might be getting a 10% bump there, I mean we're going to talk about this a little bit more later, but I wouldn't expect to see, you know, that it would, compared to what you should be seeing right near the plant, it should be a very, very small bump on the road there.

MR. SCHMIDT:

I understand what you're saying, but information we've been provided with indicates that when you look at a plant that's fairly in isolation and not related to other nearby plants, such as the Boe (phonetic) Plant in New Hampshire, that they did indeed find a hot spot there by sampling fish tissue in, you know, close to that plant, and they're more isolated.

DR. SULLIVAN:

Right, and obviously the fish tissue, you know,

I've heard of this study, but I've not seen it so I can't comment on it as to, I mean fish tissue is the ultimate arbiter here. And all I can say is that at Springfield, when they did that in the '70's, they did collect fish tissue and they were actually lower in the surrounding lakes and areas. But, again, they didn't have a prospective, you know, they didn't test it before the plant opened and after. You know, it may have gone higher once they opened the plant. But compared to other lakes in the area, it looked, it was lower, but it was the same, you know, the average is .2 here, it's .25 here, you know. And, so in that particular case there was no evidence there was a strong impact from the plant. This one in New Hampshire I've heard about and they say that there is, again, you know, I'm trying to get a hold of that study and take a look at it to see what it says. The other thing that I will point out here which is important for Pennsylvania, we picked plants that were in open areas because a) we wanted easy accessibility, we didn't want to be going to people's front yards to sample, and b) it's just easier to understand, okay. In Pennsylvania,

when you have a forested region, the deposition changes a little bit because mercury will also get on the leaves and so on and so forth, and they know that deposition is higher in the forest, okay, than in an open field. Now the question is, is it higher because of a nuclear plant, nuclear power plant, excuse me, Harrisburg you must, it's probably dangerous to say that here, but because of a coal-fired power plant, do you have an increased deposition or not? My feeling is you would not see a large increase because what deposits in the plants is elemental mercury, Hgl, not reactive gaseous mercury, and you don't really change the background of elemental mercury that much with these plants. However, that's a feeling, I don't have the data, you know, it's, okay. Maybe the plants scavenge more effectively when there is higher element, higher levels of elemental mercury, you know, because they've talked about having a threshold you know. The science is very complicated so it's an open question.

MS. EPPS:

Myron.

MR. ARNOWITT:

Myron Arnowitt, Clean Water Action. I just had a question in terms of wondering if this says more about how the model was generated in the first place and whether you looked at trying to test the model in other ways.

DR. SULLIVAN:

The deposition model, what we did is, because I'm a coward, is I just used the EPA's selected values from their report to Congress. We did do sensitivity studies and things like that and you can show those types of things. The model was validated for air concentrations of SOx and NOx at the Kincaid Plant, which is one of the reasons we picked there. But that's air concentration, not deposition. Deposition is a very much more difficult beast, particularly dry deposition. It, it just, we don't understand that as well.

MS. EPPS:

Gene.

DR. SULLIVAN:

I will say the EPA tried to pick conservative deposition parameters, and it looks like that was one of their intents, is when they looked at literature, they tried to pick the value they felt was conservative.

MR. TRISKO:

Thank you Joyce. Gene Trisko for the United Mine Workers. Since we're on the subject of soil sample analysis, I just thought it would be interesting to note that there is a hypothesis developed by a Dr. Edward Krug (phonetic), I believe he's with the Illinois Geological Survey. He points out that because of the large amount of naturally occurring mercury in soils, that there will basically always be a substantial contribution of mercury into watersheds as a result of precipitation and that the contribution of mercury flowing through soils into waterways, as a result of natural processes dwarfs the anthropogenic contribution from power plants and any other sources. Is that a factor that you've taken into account in your analysis of the local soil characteristics in this exercise?

DR. SULLIVAN:

I'm not sure what you're asking here. Are you saying did we look at the flow through the ground water pathway to the…

MR. TRISKO:

No, not the flow through downward pathway, but rather the amount of naturally occurring mercury

in the soils from which you took samples.

DR. SULLIVAN:

Right.

MR. TRISKO:

Because obviously all the mercury that you found did not come from power plants or industrial sources, only a fraction did.

DR. SULLIVAN:

Right, only a fraction, what we were trying to look for in these studies, mercury is everywhere, you go grab a soil sample anywhere in the world, it will have mercury in it.

MR. TRISKO:

Right.

DR. SULLIVAN:

So what we're trying to see is, in the region right near the plant, if we were really getting twice, three times background deposition within a few miles of the plant, we should see that in the soil, okay. It should be elevated compared to 10 miles away where the wind doesn't blow in that direction, or 20 miles away. So we were trying to look at that. This was natural mercury in soil with a component added from the power plants. So we were trying to see if the power

plant gave a strong enough signal to overwhelm the natural component. And the answer is no. From what we saw, the power plant did not overwhelm whatever was in the soil there originally.

MR. TRISKO:

Okay. What I was getting at is you would not be able otherwise to say a priori that the mercury concentration of the soil sample that you took 10 miles away, which you presumed to provide a relatively more pristine sample, did not itself have a different mercury characteristic as a result of geology. A priori you cannot determine that.

DR. SULLIVAN:

A priori you cannot determine that. And that's what I was talking about when I was saying, looking at the soil characteristics and how they're different. At the first 2 sites they are fairly homogeneous, at the 3rd site they were very, very different depending on where we went. And so the mercury, the background mercury concentration from some soil is a function of its geology, its organic content, and other processes in the soil. That's true. So to use a

background sample, you know, you have to tie that in and it's very difficult to come up with a good background, as we found out. We were, I'm not happy with any of our attempts to find background at any of these sites. The numbers were basically similar to what we saw at the sites and it's hard to discern if it's a good measure of background or not.

MR. TRISKO:

Okay, thank you. Another good area of uncertainty.

DR. SULLIVAN:

Oh, there's always uncertainty with mercury.

MS. EPPS:

John.

MR. ARWAY:

Given the fact that fish are included in the EPA definition, and you didn't include them as a receptor in your study, and the fact that the bioaccumulation rate variable would come into play with fish, and the fact that you constructed your criteria, your pass/fail criteria to be +_or – 2 or 3 standard deviations of the mean, do you think if you had included fish that it would have been much different in terms of how your

pass/fail test would have worked, understanding the fact that you would probably be dealing with different ranges of concentrations with fish that you would be with vegetation or soil?

DR. SULLIVAN:

Right. As I said, the ultimate arbiter would be the fish. We didn't choose that path for a number of reasons. One is just, as Pennsylvania knows, they get 65 samples a year, and that costs you guys a pretty penny. To get a statistically valid number of samples from the lake near there, from background, from other lakes in the area, then to control for the differences in lakes and so on, it just was something we couldn't handle within the framework of our budget and everything else like that. That would be the ultimate yardstick, you know, if you're looking for fish, that's the way to go. However, I will caution anybody that wants to do that, there's so much variability and uncertainty in fish levels and in what they are, I'll talk a little about that later in my talk, that it's going to be a very, very, you're going to have to take a lot of fish samples to get anything statistically meaningful from that approach. And that was, other people

have asked well why we didn't we just measure the deposition directly with water samples. Again, you can do that, and I'll talk a little about that, there is a site that did that, but to get a hundred samples like I've got, and then for water samples you set up a weekly, they're $100 a sample, you know, again, it's just a budgeting issue that we couldn't address those types of things. Sample collection boxes are like $5,000 each, you know, it's just, you know, all of a sudden cha-ching, cha-ching, and so we were, we did what we felt was a reasonable approach. I'm not going to say that it is the only approach or the best approach.

MS. EPPS:

Vince.

MR. BRISINI:

Vince Brisini, Reliant Energy. So, I just want to make sure that I understand the presentation to this point. In a nutshell, based upon the deposition modeling that was done, that you did that showed where you would expect the impacts to be, that if there were significant local impacts from that plant, they would show up as elevated soil mercury concentrations. And, in the case of

Kincaid, what you saw was the elevated mercury along a highway as opposed to, in your deposition model impact area, your hot spot I guess you would say. Is that a fair representation?

DR. SULLIVAN:

That is a fair representation. And at Monticello it was more correlated with the soil characteristics than location.

MS. EPPS:

I think we'll move on to your discussion of the risk assessment.

DR. SULLIVAN:

Okay. Basically, risk assessment has the following components – emissions and deposition, exposure, dose response, and then risk assessment is your population risks and the detriments we get from there. This flow chart I don't want to get into too much, but it just kind of speaks to the uncertainty involved in the process. There are a lot of steps, each one has their own level of uncertainty from deposition up through bioaccumulation through consumption and so on. One way we tried to address this we did a probalistic risk assessment where we put uncertainties on here and tried to get a range of

values as our output.

But let's talk now about potential reduction in mercury deposition from coal-fired power plants. A number of studies have been done showing where mercury comes from – natural, global anthropogenic, U.S. anthropogenic, and so on – and they ranged based from EPRI, the State of Minnesota, EPA did it, and French did it for the EPA as well. The important point to see is that for a 90% decrease in Hg emissions from coal, you get something from like a 7-1/2% to about 18% reduction in deposition, is kind of the range people are talking about here. I believe Leonard Levin, when he presented a few weeks ago, was around 7% or 8% reduced deposition in the State of Pennsylvania. So for a 90% decrease from current emission levels, you're at 7% to 15%-18% is the range where people say you're going to get in terms of deposition.

So local effects on mercury deposition, and this gets back to a lot of peoples' question. This was in the report to Congress. They say that at 2-1/2 kilometers, 52% of your deposition should be from the power plant. This is from a large coal-fired power plant, the report had

small, medium and large. Results were similar at the other sized plants, but just for example, 17% at 10 kilometers, and 7% at 25 kilometers. So by the time you get out 15 miles, even EPA was saying back in 1998, '96 or '97 when they did this calculation, when you get 10 or 15 miles out, you're only about 7% of background there, okay. That's kind of what we were saying in our modeling because we used the same models, the same type of things.

Here's what I was talking about earlier. This is the Clifty Creek Power Station, it's in Indiana. It's about 3 kilometers from Clifty Creek Power Plant so we've got a multi-deposition network that's in a State Park that's right next to a power plant. Here are all the other deposition monitoring in the State and here's the Clifty Creek in blue up here. So we see a 20%-25% effect there. So we are seeing something there that we can attribute to the power plant most likely. I mean I have not done a source attribution and done the soup to nuts analysis on it, but it's a reasonable assumption that this is an impact of the power plant. So we see that 20% increase ballpark in this particular case. And

that's about 3 kilometers away. EPA was saying 50% increase. So, we're in the ballpark. It's reasonable, a little bit less than the model, but we are seeing an effect here. And while I'm on here, because of time I didn't talk, we've also done a lot of review of the literature in this area and we do see evidence for, that near a power plant, within 5 miles or whatever, you see 20% or 30% increase in sediment concentrations and 20% to 30% increase in other things as a kind of ballpark number you see a lot and then when you get out at 30 kilometers you don't really see much at all in the literature, as terms of increases in deposition sediments or anything else like that.

Link between mercury deposition and mercury in fish, and this is a complicated scientific issue that nobody has a good answer to. There's no conclusive data at this time. There have been USGS studies, there's the METAALICUS study up in Canada right now, which (inaudible) is involved just started, this slide's a little bit old, but it's been going for a couple of years. And the deposition maps and levels in fish. This is kind of what you guys were getting at earlier here.

And this shows the mercury concentration of large-mouth bass by county in North Carolina. It's very low in the mountainous areas here, it gets higher down here in the coastal plains and the swamps, swampy area. That's very consistent with a lot of information that the metholation rate is controlled by your water body, not by deposition. The range here is from .2 and then .4, .8, and then above .8. So you see it a favor of roughly 4 in these different groups here, but the deposition, that deposition from the state clearly not a factor of 4 difference. It might be 10% or 20%, that's kind of typical of this scale range, it depends how much rain you get and other things like that. So it tells us that it's not controlled only by deposition which is one parameter. What's really controlling it are the water bodies and if you get to slow moving water bodies, higher temperatures, because this is mountainous region, this is higher temperatures, and so on, you have more metholation going on in the sediments and therefore your fish get higher. In general, along the Atlantic coast, the methylmercury levels are higher for fish in coastal plains than they are inland. In general,

they're higher in the southeast even if you go inland than Pennsylvania for example. Again, probably due to temperature effects as well as water body. So this is an important point there.

There's a substantial amount of data on mercury levels in fish and EPA's got a big database. Every State has got their own database. It's out there if you want to dig. It's not always easy to find, it's not always easy to find in a nice format where you can correlate it with rivers and streams and so on. But it is out there. When we did our risk assumption, we looked at that data and kind of got some average numbers. I'm not going to go too much into data here, but I'll kind of give you ideas what we did. We did probability distributions for different fish in 3 target geographic regions so we looked at, you know, so much large-mouth bass, so much, you know, other types of fish in the fresh water fish part, came up with probable distributions for what those concentrations were. Assume that fresh water fish mercury concentrations is proportional to total mercury deposition from all sources. Again, a big assumption we don't have a good

handle on. It's commonly used. And so then we got the deposition, we could say, okay we've decreased deposition so we've decreased our fish mercury, and now we looked at consumption patterns and said okay now what are the exposure levels and how does that change risks?

Here's an example for mean and standard deviation of different concentrations. See the southeast a little bit higher up in the northeast and so on. So then we developed the distribution of the fish, defined exposed populations, women of childbearing age, we looked at two different groups. One is the general population and one is subsistence fishers. The big difference is the general population eats about 20% fresh water fish. Again, we have data this and it depends on the region of the country and so on, but that's what's really going to be impacted by your coal plant in a local sense. Whereas the subsistence fisher we assumed ate 100% freshwater fish. So they get much higher concentrations from the local, up there. And then we did the probability distribution functions for each population and then we linked it to biomarkers hair and blood. I'm going to report on hair, just because that's

what all my graphs are, they're convertible.

A little bit about how we went about doing this risk and this is a very important, because this is a departure and it's a point I want to get across today, from what a typical, what we call risk in the mercury world. We used a benchmark dose. We had a nice discussion on that by Dr. Bell earlier today. The benchmark dose is the estimated dose corresponding to a specified incremental risk over and above background. EPA specified the risk increment as 5%. So what they did is on these finger-tapping tests or naming (inaudible) convention, they got a control sample of a thousand people and they had them tap their finger and they measured how many times they could do that. Then they defined the bottom 5% as impacted performance of the distribution. So they got that, then they looked at the control population and then, I mean with the mercury population, the mercury population they look at that distribution and if instead of 5% are slow at finger tapping, 10% are slow at finger tapping, they say that there is neurological health impact in this particular case. And they did this for about 15 to 20 tests, different

neurological tests in both the, well all the three major studies.

Here is the benchmark dose estimate from the National Academy of Science studies. Here's the Seychelles where they said the benchmark dose was 100 because they really didn’t see much effect, and 21 on these 5 or 6 tests. Here's the Faroes study. The Boston naming test, 15, what they expect the benchmark dose to be. In the New Zealand study which was a little bit lower, but as was noted, was discredited under further analysis. And what we did is we lumped all these together and we weighted the mean benchmark dose from all these measure to get a pooled benchmark dose. Again, this isn't the traditional way of doing it, it's one way of doing it. The National Academy of Science took this number, and this is the mean benchmark dose, and they had 95% confidence that it was no lower than 11, so they said a benchmark dose is 11 for effects of mercury. And they did not use any of these others to come up with a benchmark dose in the recommendation.

We pooled them, the frequency distribution taken by pooling benchmark dose is what we used.

Multiple approaches to pooling benchmark doses, you could weight them differently and so on and so forth. So I'll show you that quickly here. This is the NHANES hair and mercury population data for women and air mercury parts per million. Here are the benchmark dose curves. This is a very important graph for two reasons. It shows that all of the people at risk are at the high exposures, but it's a very small part of the population. And it also shows that there are different ways of weighting it through the uncertainty and stuff like that. For analysis we used this curve here because it was the most conservative of these 3 types of weightings. So we did the risk calculation for the northeast, southeast, midwest and west. I'll talk about a few of these. We looked at a reduction of 90% in emissions, we assumed that it's a 15.5% reduction in deposition. That was based on EPA's report by French in 1997. Doing this we get a northeast baseline risk of 1.7 times 10 to the minus 5^{th} of a child having any of 16 adverse effects, and there were 16 endpoint measurements there. In the U.S. there's 4,000,000 births per year. That would suggest that 68 children a year have a

chance of exhibiting these effects. 90% reduction in coal would knock that down to 54 people. Okay. So if you do it from what I would call, and this is my view as a risk assessment person not as a public policy person, you get these types of numbers. You can argue a little bit about it's not 68, it's 200 or something, because there's uncertainty, but it's much different than what you fear. And I want to talk about that now – fear – in the next slide here.

We also do for subsistence fishers. Here the risk is about .4% and it changes to .3% if you reduce mercury by about 90%. So what happened to the estimate of 640,000 children at risk? That's a number you see in Chemical Engineering News and so on and so forth. That's, and this is a point I want to make clear, and for a public policy perspective that's a correct statement, but from a human health risk based on the data, I don't think that's a correct statement. And what they say is there are 4,000,000 births per year. Approximately 8% of the females of child bearing age have mercury body burdens in excess of the EPA RFD. So 640,000 children are at risk of having their

mother have a body burden in excess of the RFD. The RFD is a level that EPA thinks we're safe at. So, the list they're talking about is of exceeding the RFD. The health risks that we've actually observed from the Faroes studies, suggest that they're smaller, much smaller number. And that's a very valid public policy decision, is to put uncertainty factors in an analysis like that because there are. I'm not criticizing EPA, but I want to make it clear when we talk about risk, we want to understand what that risk is. So what we're saying here is there are 640,000 children that are at a level that we're not really comfortable with, not that we expect them to have neurological impacts necessarily because you don't go from the RFD to just a little bit above and have the impacts. There's a safety factor, which is an order of magnitude in this particular case. What the RFD is based on is the National Academy of Science saying the benchmark dose below BMDL, benchmark dose level, is 11 parts per million in hair, I forget what it's in blood, but it's 55 or something like that, and they put a safety factor on there for 10 to account for uncertainty,

population variability, and everything else like that. Again, I'm not saying that's not a reasonable thing to do to be protective, but I want everyone to understand when we say 640,000 children are at risk, it's of exceeding the RFD. And the risk of adverse effects is lower, you can argue about how much lower. So what does this have in terms of reduction in mercury deposition on hair mercury. If we want to look at it in terms of the benchmark dose, what I did here is I got the blackline which you can't really see very well is the NHANES data, then on top of that I've got this purple line which is a 10% reduction in deposition which is kind of the order of magnitude we're seeing in predictive models of deposition so on and so forth. Not order of magnitude, but fairly close, it's within a factor of 2 because they range from between like 7 and 15 or 18. Then at a 50% reduction, if we could reduce our deposition by 50%, which you can't get to from coal-fired power plants, this is a reduction in total deposition not in coal-fired power plants, so this is attainable if we do a lot more things possibly, I don't know, but where we are now because we have a much higher burden

of mercury that gets re-volatized and emitted, I don't know if we could get that low again or not. But anyhow, that's this top curve here. So if we're looking to protect people from the RFD, 6-1/2% of the women age 18-49 were above the RFD on this NHANES data that I had, like 1,700 samples. 10% reduction drops that down to 6.1% and a 50% reduction drops it down to 2-1/2%.

Conclusions. Is there a hot spot? Based on our three studies I say that even though we didn't measure fish, I didn't see enough deposition anywhere to suggest that it bumped the fish levels up by .3 ppm. So it's very unlikely that we are seeing hot spots in our 3 studies. Sediment deposition data I touched on a little bit from other studies. 20%-30% increase in local deposition and minimal increase beyond 30 kilometers. That's, a body of literature, I've got some reports, I already talked about that, will make that available. The risk, reducing mercury emissions from coal-fired power plants by 90% will lead to 5%-15% reduction in deposition. With a 10% reduction in deposition, we assume it will lead to a 10% reduction in body burden. Again, a lot of uncertainty in that. If you do

that, you reduce the number of people above the RFD by about ½%. Basically the same thing there. So basically I'm saying we've probably got a 1% of the people you drag below the RFD based on, now again this is a general NHANES study, National Health and Nutrition Survey, and it's supposed to be reflective of the general population. I'm not talking about sub-groups that have high fish consumption already or things like that. I mean that's a particular topic you have to look into on a case-by-case basis as you decide.

Here's a bunch of references that we'll go into your just for your remark. If you need any of these contact me. If you have any questions, please feel free to contact me at any time. Thank you.

MR. FIDLER:

Thank you very much Dr. Sullivan. Questions, comments? Gene.

MR. BARR:

Gene Barr of Pennsylvania Chamber. Dr. Sullivan, a question about the women at risk, comparing that to the Centers for Disease Control report which came out a couple months ago which I

believe found no women above what I believe was the EPA reference dose. How do you compare those? Was there a difference?

DR. SULLIVAN:

I have not seen the details of that study. I'm aware of it, but have not seen it. This is the data we took from the NHANES report. And this is the data that EPA always cites when they're talking about people above the reference dose.

MR. FIDLER:

Vince.

MR. BRISINI:

Vince Brisini, Reliant Energy. Very near the end you have a conclusion reducing mercury emissions from coal-fired power plants by 90% will lead to a 5%-15% reduction in deposition.

DR. SULLIVAN:

Yes.

MR. BRISINI:

Is it linear extrapolation, that I could say a 70% reduction would be 4% to 12% reduction in deposition?

DR. SULLIVAN:

I'm not a hundred percent sure on that, but my understanding is yes. It depends on the model

and how much chemistry they have in there. But generally the mercury concentrations are so low they are not driving the chemistry, it's other things in the atmosphere. So I think so but I'm not familiar enough with the chemical reactions to see if it has an impact, the mercury level does.

MR. FIDLER:

Gene.

MR. TRISKO:

Gene Trisko of the United Mine Workers. A related question Dr. Sullivan, on that slide where you state that with appropriate assumptions and caveats, a 10% reduction in deposition will lead to a 10% reduction in body burden. That's assuming other things being equal.

DR. SULLIVAN:

Right.

MR. TRISKO:

Other things including that there is not an increase in deposition say from international sources…

DR. SULLIVAN:

Right.

MR. TRISKO:

…that offset any domestic reductions.

DR. SULLIVAN:

Yes. I mean, yes, it's, basically it's going, what I'm really saying is a 10% reduction, I don't care what the source is, then you can make the assumption it's a 10% reduction in body burden. Clearly if we shut off all the coal-fired power plants and China starts up twice as many and they impact us somewhere each year, but that's more of a west coast issue, yeah, it's really what your total deposition is, is going to impact. Now, other things can impact your mercury deposition. If you start doing clear-cutting, you get a lot more run-off, you get a lot more particle transport, soil particles into the river, your mercury levels go up. I mean that's been shown over and over again where they're doing deforestation type work. So yeah, it isn't all, all other things being equal.

MR. TRISKO:

Okay. The second question related to your slide on population risk based on log BMD.

DR. SULLIVAN:

Right.

MR. TRISKO:

You cited northeast baseline .00017 risk of a child having any of 16 adverse effects. Then you talk about U.S. birth rate of 4,000,000 per year, 68 children having a chance of exhibiting effects. And then 90% reduction of coal plant emissions would result in 54 children having effects, or a chance of exhibiting effects, that being a difference of 14 versus 68 children. My questions is, is that National or is it somehow related to the northeast because you cited a northeast baseline.

DR. SULLIVAN:

Right, well the northeast data, and it was a National number of births. You could scale it up or down based on your population, you know, of the State there, you know. Let's say Pennsylvania's 10% of the births in the Nation. Well then Pennsylvania would scale by a factor of 10 lower.

MR. TRISKO:

Okay.

DR. SULLIVAN:

That's just a pure multiplication of births time what we found as the risk.

MR. TRISKO:

Okay. Does the northeast baseline factor that you cite here, .000017 is that a factor that is high for other regions in the United States or low or average or what is it?

DR. SULLIVAN:

That was, we did 4 regions and it was higher in the southeast, it was 2nd highest in the northeast, Ohio Valley was 3rd, and west was 4th. And that primarily had to do with the concentration in locally caught fish. The natural concentration, well I'll put natural in quote, but the concentration of mercury in fish is higher in the southeast, 2nd highest in the northeast, 3rd in Ohio, and lower out west.

MR. TRISKO:

Okay. And then, just to extend this to the next logical step – if one were to use that northeast baseline and adjust your U.S. birth figure of 4,000,000 to whatever the appropriate number is for the northeast, that you would then have a smaller number of children at risk than you have cited here at 68.

DR. SULLIVAN:

Right.

MR. TRISKO:

And correspondingly, a smaller number of potentially affected children in the northeast. So the number in short for the northeast would be less than the 14 you've cited for the U.S. as a whole.

DR. SULLIVAN:

Right. But, again, I want to stress that was based on a risk assessment, we looked at a curve here. The dose response is a function of your concentration. There are many ways to do it. You can look at the RFD as a measure, you could look at the benchmark dose, anything above 11. Now if you look at that, that's about .1% of the population or less. It's hard to say because the statistics just aren't very good that far out on the curve, you know. The statistics from NHANES suggest .1% but you might have cell populations that eat a lot of fish that weren't accurately represented in the NHANES study.

MR. FIDLER:

Charlie.

MR. MCPHEDRAN:

Charlie McPhedran of the Penn Future. I'm interested in your assumption on page 14 – assume that the freshwater fish mercury concentration is

proportional to total mercury deposition from all sources. And I think you said in your presentation this was a little bit of a leap. It seems like a pretty critical step in the logic to me to your conclusions. And I'm wondering given that there's a lot of data about mercury in fish, not necessarily correlated with emissions or deposition, what sort of data would you need to develop a ratio or find that that's proportional so that you can answer whether that step really holds up or not?

DR. SULLIVAN:

Well, they're working on that in the METAALICUS program to try, what they're doing at that particular program is they're tagging mercury deposition with radioactive species of mercury so they can follow it. So they know that they put this mercury there. And they're trying to look at the impacts of fresh deposition, new deposition. So that's one approach they're looking at to try to understand this. It's, it's very, very hard to understand because it's a process that requires the microbial remediation so it's higher in the summer time when it's hot, when it gets colder, you know, the microbes

aren't as active, so you've got seasonal variations. You've got all sort of things going on to get to that point. Why we picked linear as opposed to anything else is we have not seen anything in the literature that suggests that it would be more than linear, like quadratic or anything else like that or exponential. The data on concentration in sediments is not linear. It actually turns over which suggests that there's enough mercury there for the microbes to act on and as you put more mercury in, you get a little more metholation out, but not a lot more. Or it could be due to old mercury versus new mercury, which is one of the latest theories now. If it's been there for a while, it's been reacted and it's not as active for the microbes, I mean, there are just a lot of scientific uncertainties in this field.

MR. MCPHEDRAN:

And how big a caveat, given that's a leap that you're getting disclosed up front. How big a caveat does that put on your other conclusions in your study if you don't really know the answer to that question?

DR. SULLIVAN:

Well, I mean, the two, I'm not sure what conclusion you're referring to, but let me, the point I'm getting across that our study shows, is that if you look at the risks, we've actually measured them, and do a traditional risk assessment which is exposure times, the probable exposure times consequence of event type thing, at various levels for various people, that number is much lower than what we see as people quoting the risk for mercury based on the RFD. I mean, that's my take-home message. We could fight, and you can bring in 20 scientists and we can fight whether that number is 64 or 200 or 400 or 1,000, you know, with some variability, depends how you do it. As I said, if you use the benchmark dose lower limit as the threshold where there's an absouloute effect, then it's .1% of the population. So your risk then is .1% of, you know, 4,000,000 births per year. So that would be, to me that's an upper bound, you know, if you believe that .1% number. As I said there are some, there's not a lot of data out there, but you know that's the best we have. So if you believe that number then you could say that's the real risk for mercury here. And then the issue

is how many people can we get below that level. It just depends on how you frame the question and what you're asking for. So, my take-home message is let's be clear when we talk about risk what we're talking about. Okay. Do I believe 64 is right to 2 significant digits? No. 1 significant digit? No. My guess based on my knowledge and the way we did it is an order of magnitude. There are other ways to do it though. And you can come up with different numbers at these low levels. And again, it was more as an illustration to point out that there's risk of exposure based on the known data and risk of exceeding the RFD. And again, I want to emphasize that the RFD is a reasonable approach to use, okay. I mean there are uncertainties. I think the curve we've shown is the best data we've got. They've spent you know, millions of dollars studying this, but it's not definitive for all people in all cases.

MR. STAMOULIS:

Can I ask a follow-up to that? Arthur Stamoulis with the Clear Air Council. I understand that the risk can obviously change depending on what assumptions you are using and then obviously you

can change the number of births you know depending…

DR. SULLIVAN:

Right.

MR. STAMOULIS:

…on what area you're looking at. It's the next calculation that I want a little clarification on. I mean, right here what it seems like you're saying is that 90% reduction in coal-fired power plants will protect 25% of the children who are currently affected. Does that hold true, that sort of ratio, if you change the other factor?

DR. SULLIVAN:

No, that changes as well. I mean, as you saw when we looked at the RFD, if the criteria is going below the RFD, it was about half the percent change. If you look at, from your area, it went from 6.5 to 6.1, so .4 over 6.5, so less than 10% change, if that's your metric. Okay. But, yeah, I mean, it's going to be in that range here. I mean a 90% mercury reduction is not a panacea for removing mercury health risks. You know, you reduce mercury by 90% from the power plants, you're still going to have pretty much just as many fish advisories out as you have now,

and everything else like that. It's going to be a small change. You're not going to see the, all of a sudden that that map becomes clear from mercury and so remain for PCBs and chlordane and other things. Now that map is not going to change a whole lot.

MS. EPPS:

Myron.

MR. ARNOWITT:

Myron Arnowitt, Clean Water Action. Could you explain on your Conclusions on Risk on page 21, a 10% reduction in deposition will lead to a 10% reduction in body burden. (inaudible) not one to one, because it seems to, I always thought that…

MR. FIDLER:

Would you please speak into the microphone so that we can hear the question?

MR. ARNOWITT:

It's hard to speak into the microphone…

DR. SULLIVAN:

Please speak into the microphone and I can hear you behind the audience.

MR. ARNOWITT:

So my question is, the 1 to 1 relationship of 10% reduction in deposition leading to a 10%

reduction in body burden, it seems, I'm just wondering if there are any bioaccumulations taken into account there. I always thought that as conception moves up the food chain that you're magnifying the impact.

DR. SULLIVAN:

Well, you are, but that's already built in you know to the system. What I'm saying is if the only change is deposition, and reduce that by 10%, I'm making the assumption that that means there's 10% metholation going on and therefore 10% lower as you go up the food chain. So you still get the bioaccumulation just like before and everything else is unchanged. So all that I'm saying is that the, your source, you know, the concentration of fish is directly proportional to deposition. That's the assumption I'm making. Now, to the best of our knowledge that's a reasonable assumption, but it's by no means been proven. As I said, I've not seen anybody suggest that it's more than a 1 to 1, meaning it's squared deposition or something like that so that you get a bigger effect. I have seen things that say square root of deposition and other things like that. If you

do correlations with fish concentrations and deposition you get something that's much less than linear. But that probably suggests it's more controlled by the water bodies than deposition there. What you really want to look at is if 1 lake or 1 river, if I change the deposition by X % what happens to the methylmercury? And that's what the METAALICUS study in trying up in Canada. That's their ambitious goal, but it's, it's certainly something that if they can tie that down, it will be tremendous.

MR. ARNOWITT:

Okay, just one other small question. In terms of looking at the number of people who meet or don't meet the RFD, have you looked at the cord blood studies that show a much higher proportion because the amount of the blood that the fetus is exposed to is at a higher level than the maternal blood?

DR. SULLIVAN:

I've seen those studies. We did not take that into account because we really were not looking at that aspect of it. They, I forget, but it was something about a factor or two higher than they

expected before. And so they’re selling that. The global answer to that is well that's kind of built into these population studies because the cord blood studies, whatever, you know, whatever it is, the mother eats fish and they measure the mother, and in the Seychelles and Faroes studies, they're also measuring the levels in the children now, mercury levels as well as doing the testing.

MR. ARNOWITT:

It would double your numbers in terms of, versus if you're looking at the number of people who were going to fall under the RFD if you make this kind of change (inaudible).

DR. SULLIVAN:

I don't think so because the, they measure what the cord blood in the parents are. Unless you're saying in the fetus.

MR. ARNOWITT:

Yes, right, because that's really the population we're looking at…

DR. SULLIVAN:

Right.

MR. ARNOWITT:

…not the women.

DR. SULLIVAN:

Right. But what I'm saying is that those effects are kind of imbedded in these population studies because they measure the mother's hair mercury and if it's double in the fetus, it's double in the fetus. But, you know, the effects are not changed. You know, the mother has a hair mercury, this is the effect, and the mother has this hair mercury. So that's kind of taken into account, but it is, again, you know, this world is full of uncertainty.

MR. FIDLER:

Gene.

MR. TRISKO:

Gene Trisko for the United Mine Workers. One more follow-up Dr. Sullivan. On the same slide with the 10% reduction in deposition and the 10% reduction in body burden. I, I must be missing something because I had understood for a very long time that about 80% of the mercury that is ingested in the American diet comes from ocean fish, marine fish for which a change in coal-fired power plant deposition, emissions, in the United States could not be shown to produce any change. In other words, we can reduce our coal plant emissions by 90%, but it's not going to

change the mercury levels in tuna fish or in shark or any other marine fish. And it's those marine fish that are comprising 80% of the input of mercury into the relevant risk group, women of child bearing age. So how do you factor dietary relationships into this linear, this very, 10% and 10% linear relationship. What am I missing?

DR. SULLIVAN:

Well, you're not missing anything. Let me be more clear then. In our risk assessment we did look at that. For the population at large they eat 20% freshwater fish and 80% saltwater fish. The 80% saltwater fish did not get a change due to the changes in the mercury deposition levels, okay. When we looked at subsistence fishers, we assume they ate all locally caught fish and they lived, you know, where it was impacted by a power plant and they got these decreases in deposition so they got a decrease in body burden. The statement there, the 10% applies, you are correct and it's probably not well worded, but the 10% would have to apply to saltwater fish as well to get a 10% reduction in body burden. It was a straight statement that if we have a 10% reduction in body burden basically, 10% in

deposition, and assume that that led everywhere, but it's not well worded on that slide.

MR. TRISKO:

Would it be more accurate to characterize that straight linear 10% 10% relationship to be applicable to the subsistence fishing population as opposed to the general population that's eating a lot of ocean fish?

DR. SULLIVAN:

Yes, I mean if you use an 80/20 split, the, you'd have to get a roughly, what to get 10%, you'd have to get 40% decrease in deposition to get 10%. So, if you factored in the fish consumption patterns and assume that fish was the only source of mercury and so on and so forth, yes.

MR. TRISKO:

And what was the number again? 40…

DR. SULLIVAN:

Well, 40% because if it was an 80/20 split, then 40% would be a 10% in the local deposition.

MR. TRISKO:

Okay, thank you very much.

MR. FIDLER:

Any final questions? Thank you very much. Appreciate your presentation.

DR. SULLIVAN:

Thank you.

MR. FIDLER:

Well, we've gotten through another agenda of presentations and last meeting we took the last half hour to an hour trying to get a sense as to what the major issues of concern were to the various organizations represented around the table, or individuals. I'd like to do the same thing again today just by way of a period of open discussion to make sure that everybody has an opportunity to speak. If you don't have a key point to make or just care to pass, certainly that's your prerogative and feel free to do that. But I'm very interested in hearing from each of the organizations represented with respect to thoughts, concerns, points that you would like to make that would be representative of the position of your organization or thoughts that even you have personally on this issue at this point in time.

Another thing that I'd like some feedback on, there were a number of suggestions made for speakers the last time and we have, we have had a number of presentations today on health effects.

We plan to delve into the issue of availability and cost effectiveness, cost effectiveness of control technologies, and if in fact there's data and a speak available to speak to co-benefits of CAIR type controls, we would certainly like to hear a little bit more information on that issue.

But I'd also like to get a sense as to whether you believe three meetings are sufficient to, you know, get to a point of involvement, feedback, discussion on the issue. I am open to consideration of additional presentations, additional opportunities for discussion. Clearly we would like to put together a straw man proposal after, certainly, the next meeting. And we would plan to have a meeting for some feedback and input on some language, but I'd just like to get a sense as to where you are in your level of comfort in having had the opportunity to present your comments and your, you know, the position of your organization. Now last time I started here so this time why don't I start with Roger.

MR. WESTMAN:

I think we're going to need quite a few more meetings actually. If you're talking about one more meeting for presentations and then

discussion, if that's what you mean, then I think we're probably in pretty good shape for that. I don't have a very high comfort level right now going either way to tell you the truth.

MR. FIDLER:

Okay. Eugene.

MR. BARR:

Thanks Tom. I guess after hearing so much of this on mercury, I guess to a large degree, I may be seeing more uncertainties than we did before we started in terms of natural versus manmade and various other things and the health benefits of consuming fish versus the possible adverse effects of consuming mercury. Clearly there's a lot there. I guess what's interesting though is I've not heard clearly anyone on either side say that, "Gee, mercury, we shouldn't be worried about mercury. There's nothing there." We've heard, I've heard no one say that we shouldn't be making these reductions, but to be honest, I haven't, to be quite blunt, heard a compelling case why Pennsylvania needs to develop their own standards. When I look at the numbers that are presented by the people that have made studies in this area, and I look at the reductions that are

going to come across in Pennsylvania and Nationwide, I'm, I'm hard-pressed to say that Pennsylvania needs to step out, particularly in light of our Commonwealth's 10-year standing position that we have State regulations that are no more Federal unless there's a compelling reason to do so. I, to be honest, have yet to see that compelling reason.

MR. FIDLER:

Okay, thank you. Billie.

MS. RAMSEY:

Billie Ramsey, ARIPPA. I guess, on this issue I'd have to break ranks with my fellow industry representatives. And the reason for that is that the CAMR Rule that EPA promulgated is on a scale of 1 to 10 of, what's the correct word, of absurdity? It is off the charts when it comes to waste coal plants. EPA promulgated a new source performance standard unique to waste coal of 1.4 pounds per, I think they're correct, correct measurement is terawatt hours which is a million megawatt hours if I'm correct, 1.4. That was based on 2 data points, 2 stack tests that was taken. Last Friday, I don't know if the people at the table are all aware of it, but EPA issued

a new Order in response to various petitions for reconsideration of the CAMR Rule that had been filed. And with respect to waste coal, they lowered the new source performance standard from 1.4 pounds per terawatt hour to 1 pound. In other words, they would, we had already appealed the CAMR Rule because not always coal plants at all times can meet 1.4. And now, as of last week, the proposed standard on the table is 1 pound. So we're very interested in a Pennsylvania rule because we haven't been able to make any headway with EPA and I'm ready to start talking about the regulation. The only question I would have still outstanding is I think Vince had asked at the last meeting for some information on control technologies for power plants. And to my knowledge there's, to my knowledge, there's been no study done of control technologies that can be added to a circulating fluidized bed boiler. And as far as I know it doesn't exist. Thank you.

MR. FIDLER:

Thank you.

MR. CHALMERS:

Ray Chalmers, EPA. I just have to say that it's

interesting and it's comforting as an agency representative. What I've heard so far seems to be pretty consistent with what EPA has stated. It seems to support the EPA's Rule. Beyond that I will re-iterate that there were of course a lot of concerns both with the delisting of power plants under 112(c) and with the CAMR Rule itself. Of course, reconsideration has been granted, the Notices have been signed and are available on EPA's website so if anyone has concerns now would be the time to submit comments or at least once those Notices are published in the Federal Register, there will be a 45-day comment period. There is also a mention of a public hearing that's been scheduled for November 17th. So anyone that would want to attend and present comments could do so. I think I would mention that of course any State rule would not relax the Federal standards. If there is any concern with that, the State rule would not change the Federal standards. And that's my comments.

MR. FIDLER:

Next.

MR. STAMOULIS:

Arthur Stamoulis of Clean Air Council. I mean obviously our interest is in seeing a strong rule in terms of emission levels. I've mentioned before we are opposed to trading. But one of the big concerns I have in all this is estimates I've seen from EPA that the full reductions expected from their Rule won't kick in until 2026. And I'd like to see what the opportunities to do better than that in Pennsylvania. Get some reductions much, much sooner. I have a newborn daughter. I'd hate for her to wait until she's in her 20's to see some of the benefits of these reductions. And it's good to hear about plants in Pennsylvania installing scrubbers. You know, I'd like to see what other opportunities there are to get some of these technologies installed as quickly as possible because I do think that's important. You know, in terms of more meetings, you know, I think we've discussed the topics that still need to be addressed. You know, we are interested in seeing, you know, a proposal and getting it to those discussions when that's appropriate.

MS. GOODMAN:

Cynthia Goodman from the Pennsylvania Department

of Health. Of course we're mainly interested in protecting the public's health and that includes infants and children and women of childbearing age as we've discussed. Today was a very informative day I think for everyone. However, I agree very much with the man that spoke earlier that we've heard about mercury and how mercury is bad, but we haven't really heard why Pennsylvania needs its own rule. So I really would be very interested in more discussion on that. And that's kind of where I'm coming from.

MR. SCHMIDT:

Jeff Schmidt of the Sierra Club. I don’t disagree with what I just heard, but I think that Arthur Stamoulis did address it to a certain extent. It's not just a matter of whether we should a 70% or a 90% reduction, it's also whether or not we should wait for decades and decades to achieve those reductions. I am hopeful that we can get some folks here, some experts who are directly involved in public health research and studies of potentially impacted populations so that we're not just talking about people who have looked at the literature, but actually people who are actually

doing that kind of research from public health institutions. So I'm hopeful that we'll have a chance to hear from them directly here.

MR. ARNOWITT:

Myron Arnowitt, Clean Water Action. I would just like to echo Jeff's point. I think that while certainly the presenters we've heard so far have put a lot of work into their presentations and providing information to the Committee, I think we need to hear from some public health experts who are working in this field. And that's something which we would certainly encourage for some additional time on. I do think that in terms of you know devoting some more time, it does sound like people are feeling a little confused over this issue of State specific versus the Federal Rule and perhaps some more time be devoted to that. Certainly our organization has a lot of issues with what EPA did with the Federal Rule and some of that is about the specifics of mercury that Jeff and Art mentioned. Some of it is just plainly about the precedent setting of changing the Clean Air Act in ways which we think is very problematic for how we're going forward with protecting public health and a

whole range of issues so there are a lot of good reasons I think for looking at a State rule, not to mention the fact that we've been asked to come up with one. But that's something which, you know, we could devote some more, some more attention to.

MR. FIDLER:

Thank you.

MR. BIDEN:

Doug Biden, Generation Association. As I stated at the last meeting, we feel that Pennsylvania should follow the Federal Rule and I haven't heard anything yet, at least at these first 2 meetings to dissuade us from that view. I think one of the stumbling blocks, one of the things that separates us from the environmental community on this issue is the hot spots issue. And we've heard a lot about that issue. I really think that a number of folks feel that some power plants are simply going to buy emission allowances and not put any controls on their power plants. And yet, as I stated at the last meeting, the Federal Rule requires Pennsylvania to make an 86% reduction from 1999 levels, that's a 95% reduction from the mercury content in the

fuel itself. That is an extremely stringent rule for Pennsylvania, extremely stringent. Now it may not happen over the timeline that you would prefer, but we have no idea at this point, we have no technology at this point, that will get us there. So every single plant in this State will either put some level of control on or it will retire, one or the other. No plant is simply going to buy emission allowances, go uncontrolled, and create these hot spots that you're concerned about. And yet we've heard from a number of scientific experts here that really the hot spots issue is not the problem that you were concerned about anyway. So I want to make that point clearly, that no plant in this State will go uncontrolled. They will either put some level of control or they will retire as a result of the Federal Rule. And I want to make that perfectly clear. The Rule is that hard on Pennsylvania.

MR. ELLIS:

My name is George Ellis. I'm with the Pennsylvania Coal Association. Like other environmental regulations, we're looking for its balance. In this particular case we'd like to

see a regulation that would allow Pennsylvania electric utilities to continue to burn coal mined in Pennsylvania while providing an ample level of public health and environmental protection. Like Doug said, we believe CAMR fits that bill. Is it perfect? No. But we don't live in a perfect world. We don't want Pennsylvania to proceed with a State reg that goes beyond the Federal Rule unless there's a documented, compelling Pennsylvania need to do so. Quite frankly I don't think that need has been, has been met. In terms of what we'd like to see, you know, at future meetings, I think the next meeting on technology is important. And I just do want to say to this point, I think the way these meetings have been carried out, the people you've brought in here, have been very professional.

MR. FIDLER:

Thank you. Next.

MR. WELSH:

Mike Welsh of the IBEW. I'd just like to echo what George said about the professionalism of the people brought in and I thought it was very good information. I appreciate it. As I said in the last meeting though, you know, we in the IBEW do

not feel it's needed to go beyond the EPA ruling. We feel that is stringent enough. I also did state the last time too that the IBEW is in favor of a cap and trade program to get us through that. We do not want to see our State disadvantaged to neighboring States, so we want people to have this eased in and have the time taken needed to, like Doug said, about given time to put the plants with tech… control systems they're going to be putting on. And we look forward like he said to hear about the technology coming in and we're looking forward to that point and the discussion that will follow afterwards. Thank you.

MR. FIDLER:

Thank you.

MR. GRAYBILL:

Lowell Graybill with the Pennsylvania Federation of Sportsmen's Clubs. It's interesting as I've been observing and listening not only to various presentations, but in some ways the argumentation that goes on whether subtly or blatantly to try to understand the scope of this whole thing. And from a perspective being concerned about the resources here in Pennsylvania that sure would

look like a local perspective and a hot spot perspective. But, I've got to say I've, I've come to a place where I'm starting to personally rule out the subject of hot spots because of this concept in my own mind of the general accumulation of a substance that we know is not a good substance. We know that there's some effects, we've heard of it, maybe not localized as much as we thought, or at least based on the presentations we're hearing, but at the same time, it's about like I don't, you know, I view it as kind of "I don't want a landfill in my own backyard" and yet I do generate a bag full of trash occasionally. It has to go somewhere. And so when I look at this whole scope, I've got to say I'm not, I'm not interested in hearing what, what minimal controls or what kind of regulations can be put in place that simply are acceptable. I guess I've got to be concerned when I look at the resources at what is the best that we can do and what is the most important that we can do. And what I haven't heard yet, and I am looking forward to, as someone said, is what are some of the possibilities. What can be done? Granted it's going to be costly and I certainly don't

have a full understanding of that. I certainly don't have a full understanding of the means and mechanisms to make this happen, but I also am not ready to say that Federal regulations, at least to the extent that I've viewed them or understood them, are necessarily the best that we can do or the only thing we can do. If they are, then that needs to prove itself out yet. But I believe I need a better understanding of what are our capabilities. Not just what can we simply get away with at this point, or what's acceptable. One other aspect that I have to echo again and that is the long-range versus the short-range. We can fill a landfill and when that landfill is full, we've got to create another landfill. As we accumulate mercury in the environment and in the eco-system, it's continually filling. If we can eliminate that mercury which we know is in emissions, then we're going to be taking, limiting, or decreasing the overall content of volume out there. So I'm concerned about the eco-system and I think we've got to look at this as a mass accumulation issue, not just a hot spot issue.

MR. MCPHEDRAN:

Charlie McPhedran with Penn Future. In the bigger picture we have concerns about the timing of implementation and trading of mercury which I know are concerns that Secretary McGinty has also expressed in response to the Federal rulemaking. We also think that the rule DEP develops should be flexible to industry. The rule we submitted with out proposal, our petition in August of last year included several off ramps, several opportunities for 5-year extensions and a standard that was written in the alternative, either in terms of percent reduction or substantive emission standard. So we hope that the eventual rule will be flexible for industry. In terms of the micro-issue of how many meetings this group should have, we in the environmental community have been communicating about suggesting some speakers. We have some promising leads that we'd like to submit next week and given the topics you mentioned, cost-benefit, availability of controls, the mention of public health here, it seems that we might be cramming it in to just one more meeting on the fact-finding end. So perhaps a fourth meeting is in order. We're certainly not eager to extend this

part of the process anymore than we need to, but we also want to make sure that there's a good record from this group. So perhaps a fourth meeting would be in order.

MR. FIDLER:

Okay, thank you.

MR. SPENCER:

Nobody from National Wildlife Federation was at the first meeting. Unfortunately we couldn't attend.

MR. FIDLER:

Would you please identify yourself?

MR. SPENCER:

Oh, I'm sorry, Rick Spencer, National Wildlife Federation. I'm here as an alternate for Felice Stadler. Our basic concern was with the Federal Rule, was we believed that mercury is a neurotoxin and should be regulated as a neurotoxin. As a result, we oppose the cap and trade system and we very much concerned about the timeframe just like our colleagues are. It seems to me though, what I keep hearing, and I've heard this from Mr. Biden here, that the technology doesn't exist to make these reductions. And I'd like to, I keep hearing that there are some

recent developments in technology in the last year or two and it would be nice to get this resolved because ultimately we are going to be talking about money. I mean our concern, we came to this because of our concern with fish and wildlife. Wildlife is our organization's name. But we also understand that the technology needs to be there. We think that it can be done in a reasonable period of time and the fact that other States are instituting regulations to limit that, limit the reductions of mercury, in effect is creating the kind of market that tends to reduce cost as well as force technology changes. So I think it is appropriate for Pennsylvania particularly in part because it's such a high State in terms of its actual total of emissions. I believe it's the third in the union. So, so in terms of, as the previous person said, you know if it takes more than one more meeting, then let's have one more meeting. But we're certainly not, we're not encouraging stretching this thing out any longer than is absolutely necessary, but we do need to get it right.

MR. FIDLER:

Thank you. Vince.

MR. BRISINI:

Vince Brisini, Reliant Energy. I want to thank the presenters again for accomplishing exactly what I hoped we would accomplish in these meetings. And we're gaining knowledge, we're gaining information, and we're learning more. But I think we still are gathering information and I look forward to the technology presentations and the opportunity to learn more there. As of yet I really haven't heard you know the compelling story that supports a Pennsylvania-only regulation. And based on the information that we saw today and in the previous studies, I really haven't seen anything that really shows that there is an appreciable difference in either local or national deposition, whether you do a 70% CAMR type rule or a 90% rule. And that's what we're really talking about here. We're talking about the incremental difference between those 2 programs and that to me is what we need to keep focused because as you reach into those going beyond that and going beyond the co-benefit type program, all of a sudden you start to put portions of the Pennsylvania economy at risk. And if we're going

to put those portions of the economy at risk we have to have a commensurate benefit. I just haven't seen it yet.

MR. CLEMMER:

Reid Clemmer with the PPL Services. Again, still like to thank the Department for continuing to apply its resources and bring these meetings together as well as the presenters. I think today is another example of, there's a lot of information that's out here on mercury. A lot more needs to be discussed and uncovered. Like my colleagues in the utility industry, Generation Industry, I think that for Pennsylvania to move ahead on its own rulemaking, it needs to be a compelling argument to do so and so far we have yet to see that to be presented. We are still supportive of a cap and trade program. We believe that is the most cost effective way to go. We are supportive of EPA's CAMR Rule, but, and I'll add to what Vince just mentioned with respect to the 70%, when he talks about the 70% incremental between 70% and 90%. In Pennsylvania it's not really a 70% program. In Pennsylvania ultimately it's an 86% reduction that's required. So we're really talking about an incremental

difference in Pennsylvania that is very, very small. I'm also concerned about the timing. And I'm concerned about the controls. So I look forward to hearing more about control technology and what can be done and how feasible can it be done within the timeframe. So with that I encourage you to have good ongoing discussions and dialogue and presentations to address those subjects. Thank you.

MR. FIDLER:

Thank you. Gene.

MR. TRISKO:

Thank you Tom. Gene Trisko for the United Mine Workers. And also, thank you again to the Department for this opportunity for a full discussion of these issues. Certainly the UMWA does support holding additional meetings to provide DEP with further input from qualified professionals in this field. Personally I regret that I'm going to have to miss the following meeting, but I have a suggestion to offer for the Department's consideration as it thinks about the proposal. Before I get to the suggestion which is kind of a conceptual outline, you asked specifically for the concerns of the various

parties around the table. And I'd like to add one more document, I guess we'll call it UMWA Exhibit 2 from today, that follows up on a comment that I made at the previous meeting about the risk, the particular risk that going beyond the Federal Mercury Rule poses for the Pennsylvania coal industry. The document that I'll hand around is one chart. It was prepared by Dr. Frank Burke of Consolidation Coal Company and provided to me this week at our request. It is a statistical distribution of coal mercury content by State for the major producing States in the east and also some in the west. PRB, it's titled Mercury Contents of Bituminous and PRB Coals, PRB stands for the Powder River Basin in Wyoming. At our meeting two weeks ago I expressed the concerns of the UMWA that going beyond the Federal Mercury Rule could, for Pennsylvania, pose a serious risk of fuel switching. And this document, which is based upon EPA's collection of ICR Part II data, and that is the coal that was actually consumed at the power plants that were surveyed by EPA, is a tonnage weighted distribution, so it is representative of all of the coals produced in

these States in the eastern and western United States. And you will see on this chart that Pennsylvania coals have the highest mercury concentration measured in pounds per trillion Btu of all coals in the eastern United States. That their mercury content is twice as great on average as the coals produced in West Virginia and Kentucky. And with all deference to our friends in the utility industry, let me speak from a little experience in this area. When Congress enacted the Acid Rain Law in 1990 which the UMWA was very active in trying to encourage the early installation of scrubbers for SO2 control. We were unable to achieve our objective of, in effect, coming out with a list of plants in Phase I that would be assured of installing scrubbers and in fact would be paid for doing so. Instead we ended up with an allowance trading program, an SO2 allowance trading program. That program has cost the State of Illinois 2/3's of its coal production as a result of fuel switching because the natural tendency when you're confronted, when you are utility burning a fuel with a particularly high content of a substance that is about to be regulated, the first

telephone call is not to the control technology department, it's not to the investment banker, it's to the fuel department. And the first question to the fuel department, as it was in acid rain, is how can I reduce the mercury content of the coal that we're burning? Give me the answer to that. And in many instances in Title IV of the Acid Rain Program, at the expense of more than 100,000,000 tons of annual eastern coal production, the answer was don't scrub, fuel switch. And that production went to the western United States by and large. Some small increases in eastern low sulphur production. So we see again here a recipe that because Pennsylvania coals have by virtue of the fact that your dinosaurs may have had a high mercury diet, through no fault of your own, a significant risk that the first telephone call will go to the fuel department and not to the technology department, if you go beyond the Federal Rule and move in the direction of a plant by plant inflexible approach without emission trading. We believe it is possible that if a proposal such as a 90% plant by plant control were to be implemented in this State together with the SO2 and NOx reductions

that are required under CAIR or under a CAIR plus approach under consideration by the OTC. And as we saw from Wick Haven's exhibit, the SO2 control requirements, further SO2 control requirements for Pennsylvania are on the order of 80%, that there will be a strong desire to move in the direction not only of coals that are lower in mercury on this chart, but also lower in sulphur content. And those coals just happen to be available in plentiful amounts in southern West Virginia and eastern Kentucky. We would not want to see the Department of Environmental Protection in Harrisburg propose a rule that implicitly risks the loss of the Pennsylvania coal industry. And we see that clearly on the horizon. Therefore, in anticipation of the discussion that you will have two weeks from now on commercial availability of technologies, I also had the pleasure of spending three years on EPA's Mercury MACT Working Group where we discussed that particular topic at considerable length. You will hear next week, among other things, that there is no commercially demonstrated, commercially demonstrated on a long time scale, mercury specific control technology, by which I'm

referring basically to sorbent injection, copack and similar technologies, not scrubbers, they exist. But there is a lot of encouraging progress on the technology front. I personally handed Deputy Administrator Holmestead a list of power plant test results on different coal types before this Rule was issued in March that showed tremendous promise for high percentage reductions on all types of coal and that progress will be accelerated by virtue of the fact that the CAMR Rule is out there, it's Law, it's Law in Pennsylvania today. Our proposal to you for consideration as you develop the Department's position on a proposal, is first do not limit yourself to one proposal. Consider multiple options including straightforward implementation of the Federal Rule. I agree with those today who have stated that no compelling case has been made in this proceeding for a separate State rule. That to me is clear. But having said that, if you are moving forward with a proposal that goes beyond the Federal Rule, include multiple options for comment by all interested parties. We would suggest that one of those options include a proposal that would accept

Phase I implementation of the CAMR Rule as the Pennsylvania plan. Accept Phase I. And the pragmatic reason for suggesting that is it is simply too late in the process, in November 2005, to consider any kind of additional mercury requirement. Pennsylvania's Phase I reduction under CAMR is 68% and that's in the year 2010. As a practical matter it is simply not possible, given the matter of construction, engineering, feasibility, and leave aside financing, to do more than what is required by Phase I of CAMR. So accept CAMR Phase I, the cap and the deadline. It's a 68% reduction, it's required 5 years from today. There's no foot dragging in this. Second, in view of the technology uncertainties, which will be discussed, consider convening this group, or a similar group, again in the years 2008 or 2009 to assess the progress that has been achieved in mercury specific control technology performance. Defer any decision now on going beyond Phase II of the CAMR Rule either in terms of stringency, limitations on trading, or time. Defer any decision now until the outcome of that process in 2008 and 2009 because as we emphasized to Administrator Holmestead last February, you

are not in position today to make a rational decision about the level of controls that may be appropriate for this substance in Phase II. You will be in a much better position to make a rational decision, one that is well reasoned, when you have better information about the availability of controls. And as one of my technology consultants tells me, the environmental community should support this proposal and not sell themselves short because with the advances in mercury specific control technologies that are occurring now for all coal types, I might note on this chart, take a look at the Wyoming content, the Wyoming Powder River Basin coal, those coals received 1.25 more allowances than bituminous coals, all right. With the progress that is being made on emission control for all types of coal, it may be that a few years from now a larger emission reduction will be achievable at lower cost. And finally let me, let me note this, if you were to achieve, if you were to propose an acceleration of the emission reduction called for by Phase II of the CAMR Rule, let's say you accept the stringency, but you don't like the deadline and you want to

move faster sooner quicker. You have to bear in mind that in accelerating that deadline you risk losing the co-benefits of the SO2 reductions that will be achieved by Phase II. If you move the Phase II mercury deadline forward, you lose the mercury co-benefits of the CAIR Rule. That means, and those co-benefits are what they are, they are free, they are the mercury reductions that will result by scrubbing in order to meet SO2 targets. No one will put an SO2 scrubber on a power plant in Pennsylvania to reduce mercury. They will do it in order to reduce SO2 emissions, and the related mercury reductions, whether they're 70% or 85%, or whatever they are for the specific power plant, those come for free as a consequence of the investment in SO2 control technologies. So acceleration of Phase II of the Mercury Rule in effect makes you pay for the mercury reductions that otherwise would come at virtually no cost as a co-benefit of Phase II. And I have more than exhausted my welcome and time in this process and hope that the thoughts that I have conveyed will be useful to your consideration. Thank you.

MR. FIDLER:

Thank you very much.

MR. CANNON:

I'll recover the goodwill of the group. David Cannon, Allegheny Energy. I just want to echo some of the things that have been said about uncertainty and that's where I find myself after two very helpful meetings and I applaud the Department for them. There's uncertainty in a lot of areas of technological uncertainty, there's deposition uncertainty, there uncertainty about your ability to affect anything downstream in terms of health risks here through a specific Pennsylvania rule, incremental to what we're already facing in the Federal Rule. So I would just say that if in fact we're looking at a standard that requires a compelling reason to go ahead and add a rule well beyond what the Federal is looking at, I have yet to see the justification for it. As we've mentioned before there is a significant amount of capital that's going to be put into complying with the Federal Rule over the next few years and I echo a lot of the things that a neighbor said. And I do want to mention one other thing and I think it was Myron who brought it up earlier. If in fact

we've got a specific population with a risk facing them that relates to mercury exposure that's not related primarily to Pennsylvania fish, there are other ways to more expeditiously and effectively deal with that from a health standpoint as opposed to a fairly convoluted incremental mercury rule which based on what we've seen may not deal with it. And then just basically I think I also roger what Charles said and what Roger said. I think one more fact-finding meeting on this is appropriate before we launch into another, and get a path forward because I think that just makes sense to me.

MR. FIDLER:

Thank you. John.

MR. ARWAY:

I'll make it brief. John Arway, Fish and Boat Commission. Literally I feel like a fish out of water in this discussion. And that's only because I've been involved for most of my career in water issues and I haven't really come to grips with the jargon associated with the Air regs yet, but gradually I am, and unfortunately this transcends air into water which is I think why we've been invited into this discussion as a

seat at the program. My experience with water reg negotiations is that you always look for compromise and I guess that's really what we're going to be looking toward once this preliminary discussion is over and the Department drafts whether one version or various versions of alternative approaches at the situation. So we're looking forward to that draft or drafts when they come out and, you know, we understand that there's equities has to be struck in the process and the anglers that we're here representing also turn their light switches on too, so they understand there has to be equity too, but I receive hundreds of calls a year asking about mercury. And I know we reached a crossroads one time when we all decided we needed to get the lead out of our gasoline. I think we're at a crossroads now and it's very apparent that, you know, too much mercury's not good, but how much is too much? Thank you.

MR. FIDLER:

Thank you. It sounds, well I appreciate the interest in additional meetings and I also appreciate the metes and bounds that you placed on that request because we will not drag our feet on this process. We have a plan that we must adhere to in order to meet our commitment to a submission to the Federal government. I would like to move forward with the technology discussion at the next meeting and see where we are at that point. I'd like to propose, and Joyce you can help me here. I think Joyce has a date or two that potentially we could add to the calendar. Whether we need both dates or not at this point is open to further discussion.

MS. EPPS:

We're schedule to meet on November 18th and the entire day will be devoted to technology discussions. We're bringing in top notch presenters. Some of the presenters are at your recommendation. I'll also reach out to EPA to have someone come in to provide a detailed discussion about the cost benefits associated with the Clean Air Interstate Rule. We have reserved this room also for November 30th. So we

will be here on November 18th and again on November 30th and then we will follow up with you as I try to get a location for a meeting in mid-December if possible. This room is not available in mid-December.

MR. ELLIS:

Is 9:00 a.m. the starting time?

MS. EPPS:

Yes, it would be at 9:00 a.m.

MR. FIDLER:

Let me just mention that I, I'm sorry.

MR. BARR:

That's all right, just real quick. I'd be interested; you said you wanted to go forward and interested in looking at more. I'd be interested in how you and Joyce have viewed the last two weeks. What have you gathered that perhaps was not there before for you or where have your opinions developed?

MR. FIDLER:

I was about to speak a little bit on that. I, just by way of observing the mechanics and interaction of the group, it seems to me that after the speakers that we heard today, some of the groups that were really focused on issues

related to hot spots, concentrations above what might be considered background or baseline, you know are, I heard Federation of Sportsmen's Clubs representative talk about, now, concern about mass deposition rather than potentially localized deposition related to power plant emissions. All of that is very interesting. I, I've got some concerns based upon some of the information that's been presented, however, I, with respect to how we might move forward, I think some of the concerns that I had personally related to the hot spot issue and at least I have not seen information that is all that compelling to this point either. But I'm also concerned about just the amount of mercury emissions that we're seeing resulting from combustion in our power stations in Pennsylvania and I think this graph is very representative as to why that's occurring. I am very interested in hearing the presentations next meeting. And I just leaned over to Joyce a bit ago as we were going around the table and I said I would really, really like to hear a presentation on what can be achieved by way of co-benefits through controls installed for CAIR. So we are going to try to reach out to RTP,

Research Triangle Park, and see if we can't, or other places, and see if we can't get some additional research or data to share with you on that issue. It's come up again and again. It's of interest to me and I'd like to get some additional data on that issue. Yes?

MR. TRISKO:

Excuse me, Gene Trisko with the Mine Workers. You have invited Tom Houston of Energy Ventures.

MS. EPPS:

Yes, he will be here on the 18th of November.

MR. TRISKO:

He is thoroughly…

MR. FIDLER:

He can speak to that issue?

MR. TRISKO:

He can address that issue.

MR. FIDLER:

Very good.

MR. TRISKO:

He studied it for Pennsylvania.

MR. FIDLER:

Okay. So those are some observations I have. I'll turn it over to Joyce in just a moment if she'd like to make some remarks. But I wanted to

mention to any of you that at the very first meeting we talked about having a lot of very open discussion and dialogue in this forum. I heard some discussions from Gene, possibly from others about the idea of some options, you know, these are some pathway that Pennsylvania may want to consider as part of a rule that would be developed here specific to Pennsylvania. We did provide an open invitation at the very first meeting that if any of you, individually or as a small group, care to set up a meeting with me or with Joyce and her staff, to discuss ideas that might be percolating in your mind, maybe developing as you discuss ideas, results of presentations, after this meeting, with your counterparts, feel free to certainly give us a call and schedule some time to come in between meetings. Because our thoughts are going through the same process and any continued and ongoing feedback and suggestions and proposals and options that you might have for us to peruse and consider, we'd certainly be open to doing that. Joyce.

MS. EPPS:

I'd like to thank you for your willingness to

participate in all of our discussions. I really have been very encouraged by the fact that any experts that I've reached out to, and in a lot of instances, on very short notice, that hopped on planes and made their way to Pennsylvania, or have gotten on turnpikes to get here to provide the presentations. I do not during this process expect to reach a consensus position. I have industry wanting a cap and trade approach, I have the environmentalists wanting a 90% level of control. So I really don't expect to reach consensus on the issues. What I am directed to do is to develop a regulatory proposal and I will proceed to develop that proposal with your input. We will be open to discussions about specific issues, and there will be options that we will need to take into consideration. When we issued the report on the petition we made it quite clear that there were a number of issues that we would have to take into consideration and those issue do include electric reliability, it also includes the discussion about whether there are hot spots or whether there are not hot spots. I think what I took away from Dr. Sullivan's presentation, there was a caveat there about hot spots and that

caveat as I saw it, was based on EPA's definition of hot spot. So I do believe that there is a need to have further discussions, but most importantly there will be a need to assess the availability of demonstrated technology. Your proposal is an excellent proposal. We'll take it under advisement. I will also mention that STAPPA and ALAPCO, the National Organization of Air Program Administrators is developing a menu of options that States could use in developing regulatory proposals. I was at the National meeting a few days ago and what was interesting was that there were at least 20 to 25 States, when States were polled, that are looking to moving forward with State specific rulemakings. When you speak in terms of uncertainty, there's also some uncertainty associated with whether this, the Clean Air Mercury Rule will stand. Even EPA admitted during those discussions that there is some vulnerability and the fact that EPA is willing to reconsider so many aspects of this rule, tells us that we need to be cautious as to how we move forward. But the directive for me is to have a proposal ready for the EQB in March 2006. That means that I'm going to spend a lot

more time with you because I do want your input. I value your input and so we will get additional meetings scheduled.

MR. FIDLER:

Okay, we do have a tentative date for a 4th meeting, November 30th.

MS. EPPS:

November 30th, in this room, starting at 9:00 a.m.

MR. FIDLER:

Okay, and the very next meeting is scheduled for November 18th at the same time. Jeff?

MR. SCHMIDT:

I actually wanted to thank you for pulling us together for this series. But I had a comment related to the possibility of developing common ground. And it actually is related to a secondary issue than the focus of these meetings, and that is as you alluded to Tom this morning, you had to leave for a meeting related to the attempt to try to overturn the Pennsylvania Clean Vehicles program which is part of the Pennsylvania State Implementation program. And if that program is overturned by those economic interests that want to block it, that's going to mean we're going to have to come up with further

reductions. To state the obvious, there are interests in this room who I think would like to see us try to get as much cost effective air pollution reductions out of mobile sources and then, you know, to reduced the impact on their interests and Sierra Club is trying to protect and support the Clean Vehicles program moving forward as the current SIB requires. So, for those of you that aren't following this closely, there's a vote scheduled on Tuesday to try to, in the State House, to block DEP from moving forward with the Clean Vehicles program. You may want to weigh in on it between now and Tuesday morning.

MR. FIDLER:

Thanks for the reinforcement. Clearly that's a concern for the agency. It's got to be a concern for the large stationary source facilities within the State so if you have the capability of contacting some Representatives that may be thinking carefully about this issue it certainly would be helpful. Gene.

MR. BARR:

I hate to weigh in a whole separate issue since we're talking mercury, but having gone through the Cal Lev program twice, including the

Commission in '93 where we voted it down, it is my understanding, and I'd like to see the information on the SIB, that we had adopted Cal Lev as a backup to Federal Tier II standards which have been adopted in model year of going for 2004. There's a huge problem in our view with Cal Lev in that as, in order to get the full benefit you need California fuel, you cede responsibility to changes made to your vehicle program to California, so I don't think it's quite that simple that says it part of the SIB. I think that we have a Federal program, again, it's analogous to what we're talking about here. In looking at it, the reductions are insignificant when you look at Cal Lev and the problems are significant, particularly when you look at what happened last month with trying to get appropriate supplies. Trying to supply Pennsylvania as an island with California severely reformulated would be an issue when you get into supply constraints.

MS. EPPS:

For the record Gene, we did not adopt California fuel requirements.

MR. BARR:

I understand. Right.

MR. BRISINI:

The point that relative to large stationary sources, quite frankly, the knocks that you would get out of large stationary sources beyond what's identified in CAIR really isn't going to provide for attainment of those areas anyway. You would have gotten to the point where when you do the modeling, you know, there's really not, there's not that kind of control. I mean the fact of the matter is if you do not implement effective mobile source controls, you're just going to have continued non-attainment areas because those controls of those stationary sources they don't make up for that lost reduction.

MR. FIDLER:

Not to debate this, but we're talking about large Title V sources in addition to power stations also. There's a lot of facilities that could in fact fall in the net on this issue. While we still have our speakers here, are there any, since we've gone around the table, are there any final questions before we break for the day? Seeing none, thank you very much for coming. We look forward to seeing you on the 18th.

1

2