STEERING COMMITTEE MEETING

EPA/NARSTO WORKSHOP ON PARTICLE

MEASUREMENT PM RESEARCH MEASUREMENT WORKSHOP FOR

HEALTH, EXPOSURE AND

ATMOSPHERIC SCIENCE

May 19, 1998

MR. GREENBAUM: Good morning, everyone. Well, this is an interesting opportunity, because we are...by design, we are in a situation where probably about half the people on the steering committee know who I am, and about half the people know Dan. So...

MR. LIOY: Funny how things work out.

MR. GREENBAUM: Exactly right. Well, I was going to leave that part out, but I wanted to, on behalf of Dan and myself, welcome you. It was a requirement that the chair of the group be named Dan, so...I don't think there are any metaphors about lions' dens or anything related to that.

And I want to take this opportunity just to say how excited I am, because I think this is a good chance for communities that clearly do work that's related to each other's interests who far too infrequently have the opportunity to really interchange and develop common programs and ideas to get together. We have people very involved in the atmospheric and the monitoring communities, people who are involved in the health effects and research community, and this group is really just a sort of precursor, shall we say, to a larger

effort to try and bring those communities together in a way that both informs and educates each other and also results in, I think, a much better effort overall.

I want to thank EPA for having had the foresight to try to put this effort together and thinking about this, because I think they understood and have understood for some time the need to try and do this in a thoughtful and creative way, and we are looking forward to the day.

I am going to briefly ask people to go around. I am not asking for full resumes, but briefly introduce who you are, where you are from, and I think, in a sentence, sort of...one sentence, say what you bring in terms of experience and background to this, and then we will go through the agenda.

I will note that, in your package, there is, on the second page of your packet, there is a version of the agenda that is formatted appropriately for those who have gotten, as I did, my E-mail version which has sort of little tips and takes here and there, and we are going to try and go through a lot today in a fairly short period of time, but before we go any further, why don't we just start?

I will say I am Dan Greenbaum, president of Health Effects Institute. We are an organization that funds a substantial amount of research on particulate matter, and we are funded jointly by USEPA and by the industry.

MR. ALBRITTON: I am Dan Albritton with NOAA's Aeronomy Laboratory in Boulder, Colorado. We look at chemistry and dynamics of atmospheric processes that relate to several issues, ranging from stratospheric ozone to surface ozone and particulate matter and fine matter, and I am co-chair, with Dan

Greenbaum, of this group.

MR. SAMET: I am Jon Samet from the Johns Hopkins Department of Epidemiology. I am an epidemiologist and pulmonary physician. Worked on air pollution for a long time, and have chaired a group in that regard.

MR. KOUTRAKIS: I am Petros Koutrakis, professor at Harvard University, and my interests are in measurements and PM exposure assessment.

MR. LIOY: I am Paul Lioy, deputy director of Environmental and Occupational Health Sciences Institute of New Jersey. I have been involved with air pollution for many years. We work on multi-media of exposure, and I was also part of the group chaired by Jon Samet.

MR. SCHLESINGER: Rich Schlesinger at the Department of Environmental Medicine at NYU Medical School. I am a respiratory toxicologist. I have some of Dan's money and glad to be part of the group.

MS. HERING: Susanne Hering out at Aerosol Dynamics which is just a small company in Berkeley, and we develop measurement methods for airborne particles, for fine airborne particles, most recently, looking at continuous measurement methods.

MR. MEAGHER: I am Jim Meagher. I am with NOAA in the Aeronomy Lab in Boulder as well, and my primary working capacity is in oxidative chemistry and some work with aerosols as well.

MR. CASS: My name is Glen Cass. I am a professor on the environmental engineering faculty at the California

Institute of Technology. Our principal interests are in the design of air pollution abatement strategies for large regional air pollution problems. This also involves air quality modeling of various atmospheric pollutant concentrations and determining the source of those rates. We've begun to take those analyses.

MR. FELDMAN: I am Howard Feldman with the American...I am the research program coordinator for air research with the American Petroleum Institute. API is interested both in the health and the air quality parts. I personally am doing PM research since the 1980s.

MR. DEMERJIAN: I am Ken Demerjian, and despite what this says, good Armenian names always end in i-a-n. I am a professor in the department of Earth and Atmospheric Science, and I am also director of the Atmospheric Science Research Center. The majority of my interests have been in the oxidizing capacity of the atmosphere. We do a lot of baseline trace gas monitoring of a variety of species that are helpful to understand those processes, and we will be moving into the particulate arena in the near future.

MR. COOK: My name is Jeff Cook. I am with the California Air Resources Board. I am a branch chief in the Monitoring and Laboratory Division, and we have been doing network PM_{10} and $PM_{2.5}$ for about 15 years or so, including speciation. We are implementers of the Federal regs.

MR. CADLE: My name is Steven Cadle with General Motors Research and Development Center. As you might guess, I am interested in vehicle emissions impact and control of both sources and atmospheric impact.

MR. MAUDERLY: I am Joe Mauderly with the

Lovelace Respiratory Research Institute in Albuquerque which is involved in health studies, health risk, health outcome kinds of studies. I have a physiology/toxicology background. I am a chair of the Clean Air Scientific Advisory Committee, and I am a member of the Orange Book Committee. So, mostly what I do is get on airplanes and go argue about air pollution.

MR. ANLAUF: My name is Kurt Anlauf with the Atmospheric Environment Service. That is part of Environment Canada in the Toronto area, and my experience is in oxidant chemistry research in atmospheric chemical processes and meteorological processes.

MR. SAXENA: Pradeep Saxena with EPRI, Palo Alto, California. I conduct research on physical science aspects of air pollution.

MR. NEAS: Lucas Neas. I am an epidemiologist, Harvard University. I am moving down here to EPA on June 19th, not June 1st.

MR. COSTA: I am Dan Costa. I work here in Research Triangle Park. I am the chief of the Pulmonary Toxicology Branch, and myself and people in my group have been working particularly on the aerosol issue regarding the PM matter in the last few years.

MR. VANDENBERG: I am John Vandenberg. I am the assistant director of the National Health and Environmental Effects Research Laboratory here at EPA. I am primarily responsible for much of the strategic planning that we do on particulate matter research.

MR. BACHMANN: I am John Bachmann with

the Office of Air Quality Planning and Standards. I have been involved in the review and research related to particulate matter standards since the '70s. I am an acolyte to the burning bush report.

MR. SCHEFFE: I am Rich Scheffe. I am also with the Office of Air Quality Planning and Standards. I am the group leader for the monitoring and quality assurance group which, effectively, is responsible for a lot of the rationale and oversight to the nation's regulatory monitoring networks.

MR. WIENER: I am Russ Wiener, and I am chief of the Atmospheric Methods and Monitoring Branch, and I am an aerosol technologist by training. I have been involved with a lot of EPA's aerosol program, especially the SRM for the last two years.

MR. ZWEIDINGER: Roy Zweidinger with ORD, NASA's pollutant research lab. In the last year or so, I have been working trying to coordinate the PM research activities within NERL and spending a lot of time working with our research monitoring platforms and coordinating research on some epi studies with the NERL group.

MS. SHELDON: I am Linda Sheldon. I am with ORD. I am in charge of all our human exposure measurement studies, including our PM studies.

MR. WILSON: I am William Wilson. EPA hired me in 1971 when they decided they wanted to have an aerosol research program, and it has really grown. Today, I am representing the National Center for Environmental Assessment. We write the criteria documents, and I had a role in the particulate matter criteria document and the PM research needs document.

MR. GREENBAUM: We have benefitted in the

planning for this meeting from all the people around the table and also input from others, and I thought it'd be good just briefly for the people who are also here just so everyone knows who is in the room and who is participating to also identify themselves. Kevin, do you want to start?

MR. DREHER: Kevin Dreher. I am principal investigator in Dan Costi's group. Been working with Dan for the last five or six years, looking at health effects.

MR. VICKERY: I am Jim Vickery, the assistant laboratory director for the National Exposure Laboratory. I work with Russ and Roy and Linda, and I thought just keep the EPA numbers what they've done, and I would recede into the background and let them do the things they do well.

MR. FUERST: My name is Bob Fuerst. I am with the National Exposure Research Laboratory. I am the project officer for the logistics of this meeting and the July meeting and also the professional services contractor that helped to bring a lot of people here.

MR. SOLOMON: Paul Solomon, ORD. I have a lot of experience in PM.

MS. BENSON: I am Fran Benson, and I am the person that has talked with most of you for your assistance in conducting and getting together the meeting. If we can be of any service to you today, just let me know. I will be more than happy to try to help you. Whether it is to change flight reservations or anything, I will be glad to try to help.

MR. KUSAK: I am Jack Kusak. I am the deputy director of the National Center for Environmental Research

and Quality Assurance in EPA. We are the organization that gives the grants for PM research and other research, and we think the PM Center's announcement will be out around noon today.

MR. CLINE: I am John Cline. I also work for the Exposure Laboratory. I was hired in 1971 to offset any good work that William Wilson was doing. He's the contracting officer, but I now work as sort of an advisor to the NERL people on extramural procedures.

MR. SMITH: I am Dean Smith. I am here representing EPA's Risk Management Laboratory. I am an analytical chemist by trade. My primary interest is in source characterization and source identification.

MR. GREENBAUM: Thank you. We have a few organizational details of the day and want to go over those quickly before we get into the bulk of the meeting, and go to Dan Albritton who will go over the meeting itself and the framework of what we are trying to accomplish, but Russ Wiener who has been organizing this has a few words.

MR. WIENER: Thank you, Dan. I just wanted to say a couple of words, because I was asked to help organize this for EPA and to get NARSTO's involvement.

I want to make sure that everybody recognizes that, essentially, the purpose of this meeting is to look at the broad implications of PM research and monitoring. EPA, of course, has particular needs, but we are primarily addressing those here. We want you to consider just the overall scope of needs that the whole community might wish to build in a research and monitoring strategy.

One of the things that...we are all aware that we have

been concerned with the potential of conflict of interest and other problems that EPA has in conducting meetings. For that reason, we have arranged a variety of procedures around these meetings to try and allay those types of problems, and I have John Cline here to help if you have any questions and you want to talk with him at any point.

Those are just some administrative words that I wanted to mention to all of you before we started. Thank you.

MR. GREENBAUM: I think we should mention one other thing which is that, in part, as part of that effort, this proceeding is being recorded, not because we expect to see this show up on the front page of the New York Times next week, because I doubt that the New York Times would want to print anything we say here today. But in the event that there...as this whole program moved forward, in case there were any questions about what happened here or what didn't happen here, people just wanted to make sure that we had that.

I think the key here is what we are trying to do is bring together people's ideas and give the kind of guidance to this system that will be necessary in the broad brush for how we go forward to accomplish what needs to be accomplished with monitoring, but to do it in a way that we will be maximizing the benefits of a variety of topics we're going to talk about today.

As Russ alluded to, we are not here to write or specify or do the details of what the procurements are going to be and those kinds of things, and I don't think we wanted to be here to do that anyway, nor should we be here to do that kind. I think we will be able to sort of walk that very thin line.

So, with that, I am going to turn it over to Dan.

MR. ALBRITTON: I thought it would be useful, perhaps, to start off with a brief calibration point. We are a diverse group, and I have two short overheads that will give us, perhaps, the context for our discussions during the rest of the day.

Seeing the position of the overhead, I not only promise to be brief, but I also promise to block at least everybody's view at one time.

This is my version of our context. We are basically here, because many of you have participated in noting that the abundances of fine particles are correlated with health problems. This, during the '90s, became clearer and clearer, and as a result of your work and your colleagues' work, those entrusted with the protection of the public health, as you well know, issued a set of $PM_{2.5}$ standards last year and then outlined a sequence that involves updating the understanding periodically but, secondly, beginning rather rapidly, a regulatory monitoring program whose data would be needed, in fact, to characterize areas in which this health problem would be most severe and also put on the books the requirements, late in the next decade, for actions to be laid out and then, in the following decade, to test to see whether the process is being circular in the sense that there are improvements in the atmosphere.

Paralleling this, of course, for your health research, those of us involved in understanding the atmosphere have, over this period, examined what emissions contribute to fine particles, what chemical transformations occur that lead to them, what are the direct emissions of fine particles, what are the dynamics that relate to them, and try to offer, in fact, people like yourselves on the health research side, information that we hoped was useful in teasing out

these correlations.

So, this is a cartoon version, I think, of why we are here, but also included in that is the next step which is really the reason why we are here, and my version of the next step could be sketched out like this. We are here. Your health studies are behind us and initiated the attention of decision makers, utilizing an atmospheric basis of information.

But what is more important are the things here noted in green, namely, having noted these correlations with health and mass and PM_{10}, what, basically, are the causal elements of those particulate matter exposures that are inducing the health problems? Secondly and very importantly, what are the biological processes that they induce that lead to the deteriorated health?

And, thirdly and equally important in terms of taking actions is trying to define, literally, what are the breathing zone exposures that are involved, and, fourthly, what, in fact, of the whole population, which are the ones deemed most susceptible and, hence, providing very critical advice into the decision making process?

And from an atmospheric perspective, our work is equally cut out for us. If, in fact, there are going to be further and more detailed studies defining causal mechanisms in the health process and defining populations at risk, there is going to have to be a much sharper picture of the PM distributions across North America, what are not only abundancies but what are the details of the species and sizes that would help provide the data base for those hypotheses on the health side.

Secondly, in addition to how they are distributed, are we smart enough to know what causes those distributions? In particular,

are we smart enough to know what the source attributions are that relate to the specific and yet-to-be-determined health-related characteristics of those aerosols? And, pushing it further, can we assist this group in time by specifying if we were to change source I, what exposure J would respond to that? Because that is, in fact, the linkages on actions here.

Then, finally and, I think, very importantly, this is a multi-decadal sketch. Are the trends, after actions, better, or, strangely, could they be worse? In a sense, an accountability phase of this process that says we on the atmospheric side and you on the health side understood it well enough that we are on the track toward addressing the problem.

I think, in this cartoon, one might pull out four points that I think are going to underlie all that we and our colleagues do, and what is so intriguing...and Dan Greenbaum mentioned that...is that we have the opportunity here to, basically, I think, do this right, and that is start off with the health research and the atmospheric research in step and co-planning how we would provide each other the questions or the information. It is recognizing at the outset that this is a joint problem. Noting in the policy time table that those charged with protecting the health do, indeed, have some short-term information needs. Things will be considered and thought about in the 2002 time frame, and a near-term goal for us, although we know that is a very short time from a research standpoint, a near-term goal for us is how can we improve the information base that would be considered in this review, and then, realizing also, though, and interacting with policy, hopefully, in a fruitful way to explain that this is a long-term problem, much more complex, perhaps, than the ozone

issue, and we know it is a multi-decadal problem.

How, from the research perspective, can we lay our plans now that will provide, perhaps, information that will be desperately needed 15 years from now while, at the same time, getting some short-term things?

I also believe that all of us have down in the last turn of our DNA the feeling that a problem this complex is going to surprise us at least once and probably surprise us many times, and the question is, are we flexible enough in the research, is policy flexible enough in receiving advice, to be able to accommodate surprises as a blessing and not a curse? I think that and all of these are our general charges.

What I would like to do now is just to end this wrap-up with asking where, in this whole sequence, does observations come into the fore? And I will do that, again, by peeling the onion a little bit in the following way, and this will introduce the two next speakers.

Narrowing it to the research context of what we are doing, we all know from our past experience that we are part and only part of input that must be admixed by those who protect the public, taking science as one element of input for those decisions. Our role in this on the health and atmospheric side has several categories. I have mentioned some.

I have highlighted here two where I think the health and the atmospheric share a great deal of interest together, namely, what is the exposure and to which population and to breathing zone can be aided by atmospheric observations? Conversely and equally importantly, as we lay out a measurement program across North America, where those are done and how they are done link very much

to helping characterize that exposure.

So, here are topics that cover the whole field of the science that must be a part of the input to this policy.

I draw this little sketch, because I think it sets up what we will hear next which is how the National Academy has, at the request of Congress, taken a look at this list of items and come up with an initial plan and thoughts about how to approach such a complex issue, and we will benefit from Jonathan's summary on that point.

Now, focusing really down to our work at hand, and that is, what are current plans of EPA and other agencies and the private sector, universities from a research perspective, what are the current plans and prospects about this part of the problem that this group shares together? And I have sketched out here a very, very brief summary of what Rich Scheffe and John Bachmann very nicely laid out in your handout which is a summary of the current EPA plans for the hierarchy of observational networks related to PM.

And as many of you know, well underway is a large set of reference sites which are very heavily compliance oriented. Among that are a couple of hundred special purpose sites that may be looking at spatial distributions or other aspects of this, the representativeness of a particular reference site.

A smaller but important set are visibility or haze oriented sites where, under this network, the emphasis is on a size/mass, because the current cut on the policy is toward annual or 24-hour averages of size and mass. However, another group of observational network sites are for chemical speciation where, in addition to total amount, there are elemental analyses that try to characterize how those

particles are made up, what elements are in them, and also a smaller set co-located with many of these that examine processes in higher time resolution to look inside of some of the broader studies here.

Last week...and the timing is very, very beneficial for us here...last week, a focus group of experts looked at the characteristics, the desirable characteristics of the chemical speciation, and we will hear on the second item on the agenda from Petros as to what insight that group can bring to us from that standpoint.

Now, toward the lower end of this list is, of course, our primary reason for being here, and that is in this spectrum of sites, the plan would be, from both a Federal and a private sector perspective, was to have somewhere here anywhere from five to seven...and those are rough estimates...of specialized sites that could offer a useful dimension to these more regular or routine sites to get at many of the hypotheses for both the health and the atmospheric side that is related to this. So, this brings us, then, to our task at hand. How, in this context, can we work toward defining a set of intensive sites that may have very different characteristics, depending on the part of the country, and how can we interact fruitfully in that sense with the chemical speciation sites?

So, this, roughly, is our task at hand, having gone through the larger picture down to what our job is here and at our workshop. And let me just close by pointing out our aim for the rest of the day.

As I mentioned, there are two very valuable perspectives to today's discussions, both the broader set of research issues with the PM health issue as a whole, the chemical speciation expert group

that examined that problem in detail. What we hope to do after their summaries is I will try to lay out what Dan and I had put down as the information that we received from you on this last round, some of the highlights and how the thinking may be changing from that, and then, with that draft plan in mind, the idea here would be to move through the various objectives and get more detail and other input into this, aiming toward the end of the day to look ahead to how we could approach the July workshop where we seek an even broader input.

So, this is the broad picture of what we are doing here, and let me indicate just an element of the time table, and that is, today, work on improving the draft concept paper that you had seen a zero thought or version of and, secondly, in July, involve a broader input and shareholder community in our process, aiming to, after the July workshop, to conclude with a picture of approaching those high intensive research sites in the context of the PM information needs.

Lastly, let me mention it is the hope of several of us that this idea of having the health and the atmospheric communities co-plan activities that we are hoping that this activity is only a start at that, and in July, as we bring in the broader community into that joint effort, is to try in some fashion to continue that iteration into tackling the research aspects of the PM health issue.

So, that is a very broad look and perhaps, Dan, we could take a comment or two on that before hearing from the Academy summary and the speciation summary.

MR. GREENBAUM: Questions or comments on what Dan has summarized here?

MR. ALBRITTON: It is a nutshell version of what you know in more detail as experts.

MR. GREENBAUM: I think Dan has done an excellent job on sort of laying out, because I think all of us are here, in part, because we are not unfamiliar with these questions and topics, but I think it is important to focus on them and also to remember that what we are trying to do here is not resolve every one of these questions but move a step further today in laying out the meeting in July as being a place where we can get a broader consensus.

Yes?

MR. COOK: One question, Dan, on the earlier part on the time line. You had mentioned that...I think I heard this correctly...that some of the output from this group may be ready in time for the first review of the PM max. Is that a realistic time schedule for...

MR. ALBRITTON: I would actually hope maybe for a little more, though, and that is a specific output from this group would be to try to write up in a concept paper or plan how we would recommend that high intensity research grade sites could help resolve this.

Now, can those sites be implemented and have some observational or theoretical or process data by the 2002? The answer is probably yes and no, and the yes part of it is that I think some plans are already underway for some types of sites of this ilk, and, hopefully, our work here would enrich those plans.

Now, whether you could start a complex measurement site from scratch in a year or so and have insight that has been vetted by the community in time for the 2002, it would be a push. So, I think we will see some contribution but not as much as we will certainly see

on the next round or sequence there.

MR. GREENBAUM: Yeah, I think it is...when you also back away from 2002 to a realistic schedule of when science can be considered in the criteria document and others, it is a real push to get substantial amounts in from these supersite kinds of ideas.

On the other hand, number one, I think there is some transitional benefit of this discussion to what things that are underway, but, also, we really have to be more tasked, you know, as trying to design something that is going to be sustainable over the long term, because I think these questions are going to continue to come back.

First of all, the reviews of the standard happen on a regular basis. Secondly, really, the kind of designs and monitoring we are talking about, although they are focused on PM, if we do this right, are going to give us an opportunity to look more broadly at air pollution over the long term instead of these just constant five-year cycle response, you know, after the fact to whatever issue we are on.

I don't think our primary goal here is to sort of say what can we do in the next year and a half or two years? It is something to think about obviously, but we have a very important task here today.

MR. LIOY: I was looking at the supersites maybe a little differently. Beyond the next revision or the next discussion will be the state emission plan and development, and I would think that one of the critical things that supersites would do and the advance volume site would do would provide useful data for developing what I would call coherent and maybe logical implementation plans for the SIPs, rather than just basing it on mass

and supposition and guesses.

I would like to see that maybe one of the aspects of this whole process would be to see how soon these supersites can be used to help us guide the SIP planners as well as ourselves in terms of understanding health and exposure issues.

MR. GREENBAUM: Well, of course, when I was a commissioner in Massachusetts, we never guessed. We always knew all the time.

SPEAKER: Same in New Jersey.

MR. GREENBAUM: Right, but...

MR. ALBRITTON: I think you are exactly right.

MR. GREENBAUM: You are absolutely right, and there is a whole series of those kind of contributions ranging from sort of standard setting decision making to risk management plans and State implementation plans to...and I think it is a very important part of what plan we will talk about later today...to evaluation of the management strategy, both from an atmospheric point of view and also from the health point of view, and that is why I talked about being subject to being sustainable, because those are decisions that are going to be made over a couple decades, not just between now and 20002.

Thanks. We will turn to Jon who is going to lead us through the wilderness.

MR. SAMET: Well, I probably don't need a half-hour under two assumptions, one, that many of you have read this, and the second is that I refuse to answer any questions about what the Academy press release on particulate monitoring means.

Forget it. That is off the table.

As already noted, there are many members of the committee sitting around the table, including Joe who is right in my way and...

The report is the first of four, and I think the report is interesting because, for one, this report probably set the Academy's record for actually getting a peer review report accomplished and out the door in...when the Academy signed the contract, the requirement was actually that a report be submitted to Congress within four months of the contract date that was peer reviewed, and it would address short-term research priorities.

We actually had our first committee meeting in approximately two months, in January, about two months before the deadline, the second one a month later, and then accomplished the work of developing the report over that time. In part, by probably doing more than we might have in terms of just addressing the short-term issue, we probably, I think perhaps tantalized some readers by going into issues in not quite the depth that one would want, but on the other hand, I think what the Academy committee did was not to fall into the trap of saying here is short-term priorities later to be followed by long-term priorities. They are really, I think, totally intertwined.

And I think what we said is we need a research plan, and I think this really follows up on Dan's remarks, and I think that is why this meeting and discussion is so important, because any plan for long-term monitoring should have in mind how the information coming out can be used to look at health consequences. And I think that would fit very much with the sort of strategy that the committee put forth.

Many of us had already participated in research planning activities, whether that was the EPA's process itself, a CASAC review of the, I guess, the 1996 plan, the 1997 workshop. So, this was not necessarily new territory for us, but we were given a chance to think through the issue again.

So, I assume everybody is familiar with the report. It says, number one on it, our second report is actually due out towards the end of this year, and that is supposed to be focusing on the long term, and, again, I think most people sitting around the table know that the committee will be meeting here June 22nd and 23rd to learn more about the research in place at EPA, and that is really our first committee meeting since we have been in recovery mode for several months in putting out the first report.

I will just say, parenthetically, I don't think the committee wants to be like itself anymore in terms of setting records for getting reports out the door. This is an extraordinary effort.

Now, in developing our research approach, we really didn't do anything more extraordinary than to sort of go back to basics to get organized. And in this kind of straightforward paradigm that we are all familiar with, we tried to get organized with thinking about where research should focus and where the uncertainties lay.

The committee put together a listing of uncertainties within this model that it saw as key, and then it tried to assign priorities to try to look at research needs and then assign priorities to research needs to address the key uncertainties, and there were criteria that were used by the committee, the policy maker's need, validity of the information, the feasibility of timing of doing the research, and the costs. And for each of our research

recommendations, we tried to go through those four criteria.

So, we were organized and systematic and organized around this.

Now, we recognized that the way the committee was constructed initially...and we will be adding members, but our focus was what we called over here towards the right rather than towards the left side in terms of looking at sources and source receptor modeling, and this is an area that we intend to go back to.

But, in part, we felt that, for the moment, we needed to gain a better understanding about what aspects of particles may be determining toxicity before we could begin to think about source-receptor relationships. So, our emphasis was sort of over on this end of the paradigm in this first report.

We had listed out...and these are just a couple of things straight out of the report...what we thought were some of the key scientific uncertainties. Essentially, at the time that the decision was made to have a $PM_{2.5}$ standard from, you know, a very simplistic standpoint, what the epidemiological data were showing were associations between indicators of PM mass concentration, whether that was TSP or PM_{10} primarily and then precious little data on $PM_{2.5}$ and either mortality or morbidity and then even less data indicating what aspects of the PM might be linked to the adverse health consequences.

So, what we then designed was a research program that we felt would provide more insights concerning what aspects of particles are critical, and some of the uncertainties that we felt were there in trying to understand what we learned from the epidemiological studies are shown here. Again, this is out of

the...from the report.

There was a great deal of emphasis placed in discussing the epidemiological literature on the relationship between concentration measurements made, particularly, for compliance purposes and human exposure, and there had been relatively little work, particularly, involving those individuals who we think are susceptible to understand those relationships. And, in particular, there had been even less work trying to understand temporal associations between concentrations measured at outdoor sites and variation on a time basis in personal exposure.

So, there were a number of uncertainties that were identified in relationship to the use of a concentration measure as an indicator of exposure. Then, this can become even more detailed as one moves from thinking about PM to thinking about specific components of PM or the chemistry of particles. So, there was very little data...and this was during the review of the epidemiological data through the criteria document and the staff paper discussions and the materials presented to CASAC. This became one of the sort of the touchstones that everyone kept turning to, what do we really know about human exposure.

So, our research agenda places early emphasis here. And the problem is actually the measurement error problem here...some of us have had lengthy discussions about this...is not an easy one. This is not a source apportionment problem. It is something different.

We also focused in on exposure-dose relationships, and, again, we have a variety of lung models in understanding exposure-dose relationships for the normal lung but very little for the lungs of

the people we think are susceptible to particulate matter, persons with lung disease, asthma, chronic obstructive pulmonary disease who we know have different deposition patterns in the lungs for particles from persons with healthy lungs, persons with heart disease, older persons, and infants. So, this is, again, another area of uncertainty.

Then, the relationship between dose and response, and here, there are many needs in terms of trying to understand what we have observed epidemiologically, exacerbation of heart and lung disease, actual increases in mortality from heart and lung diseases and total mortality and trying to understand what are the underlying mechanisms, whether they are induction of inflammation in the lung and systemically, how host offenses may be adversely affected by particulate matter, and then the possibility of neurally mediated effects of, for example, leading to cardiac problems. So, there is a great deal of work toxicologically to be done here.

Now, what this resulted in was the famous ten research recommendations. I know that Jim Reese's goal was actually to have a stone tablet on the front of the work with the ten commandments and the burning bush, but, apparently, we were only able to have, I guess, as John called it, the burning bush report. Maybe the next one will have the commandments on it.

MR. BACHMANN: It is all the same list.

MR. SAMET: Yeah, it is all the same list.

MR. VANDENBERG: We could go further and have twenty.

MR. SAMET: Now, this illegible chart I have now been shown many times by people and say I know you can't read

this, but...but what this is is the committee's research agenda. And what we did is we called this a portfolio. Okay? We got a little carried away with this, but we thought it was kind of cute. You are going to address, you diversify, and you look at things over time.

What we did in laying out this research program was to say, first of all, these are all equal elements. So, it is not a question of, you know, which one of these is most important. We really felt that if we wanted to, you know, in the end...and Dan laid out the fact that we really have...we have to have a long time line here. We have to develop a research program that is ongoing, sustained, not kind of this one or two-year burst of energy and let things go, and we are not going to be able to answer any of the long-term questions unless we take a long-term perspective, and I think we need long-term monitoring and support in the programs. So, there is something like a 13-year time line or 12-year time line for the research program.

The ten categories, the research recommendations were grouped back to our paradigm. So, source and concentration to exposure, exposure, dose, and response subdivided, and then some additional issues related to analysis and measurement, and measurement error specifically.

The emphasis varies over time in the research agenda. These numbers represent millions of dollars per year, and, again, these are sort of the committee's best estimates of the dollars needed, and you may ask questions about whether it is all new money versus old money and such. Don't ask.

So, the emphasis early on...there is an early emphasis here in terms of exposure, really directed at some of these questions of what are the exposures of susceptible, potentially susceptible

individuals to particulate matter, how do those exposures vary over time, and how much of the temporal variation is driven by out...is related to outdoor concentration. And, in fact, some of this kind of work was included in the recent submissions to the Health Effects Institute.

There is some emphasis but then an expanding emphasis later on on source-receptor modeling here. You might notice that there is a number 2, outdoor versus human exposure early on on the exposure side and then number 2 is exposure to toxic PM components sort of kicking in later.

What this reflects is, right now, I think if you turned to the health community and said what is it about particles that makes them bad for people, or what is it about a measurement made of ambient $PM_{2.5}$ or PM_{10} that is the actual thing that is bad that damages the lungs and affects the heart, you would get a variety of conjectures from the epidemiologic and toxicologic and clinical community, but I think they would be hypotheses, and some of them could be reasonably advanced, but this is the work that needs to be done, really, over the next five or so years to identify what those toxic elements might be.

So, there is sort of a cycling here and an iteration, maybe the time line's not exactly right, but it is somewhere in here that we will need to come back once we have a better understanding of PM toxicity and look at human exposures to those components or aspects of particles that we think are relevant to disease.

So, there is a substantial emphasis early on on toxicologic and clinical studies. By clinical studies, I mean human exposure studies to try and understand what those toxic elements may be.

You may notice that, in fact, any major component of epidemiologic research is somewhat delayed, in spite of the committee being chaired by an epidemiologist. We really felt that we needed to gain an understanding from the toxicologic work of what aspects of particles need to be looked at before the write-up of the epidemiological studies could be designed, and we think, in fact, we need to sit back and strategize about how this should be done.

We felt that, with some intense work, the exposure-dose issues could be addressed and we would have a better understanding of exposure-dose relationships for people with diseased lungs.

So, there is, here, the toxicologic component directed at particles, then issues directed at how particulate matter and other pollutants may act together, work on susceptible populations, and, again, early on, the work on toxicity mechanisms, getting down perhaps to more fundamental levels, and then dealing with the initial work on the measurement error and data analysis. So, this is how the program sort of plays itself out, and, again, for those of you who have read the report, we present these as elements of an integrated program.

I think from the point of view of how this type of strategy interacts with the monitoring, really, I think to do the epidemiological studies properly and to think about new strategies that are cost efficient and sort of statistically efficient, it would be very useful to be able to place epidemiological studies in the context of areas where exposures have been characterized as ongoing commitment to monitoring and perhaps already some substrata's been laid for doing epidemiological studies and looking at the relationship between what is being measured at monitoring sites and human exposures in the

populations.

So, I think that to conduct epidemiological studies at this kind of price tag, it would really need to be nested in areas where ongoing exposure assessment of high quality is being maintained. So, there would need to be a commitment.

Perhaps the initial work could provide some guidance in terms of siting epidemiological studies. I guess what, how many sites were mentioned? Was it five? So, maybe you could have six and call it the Six Cities study.

In any case, I think there is good opportunity for...there are very important opportunities for interaction, and I don't think we can sort of design studies, again, like the Six Cities study where both the epidemiological work and the exposure assessment are, you know, funded primarily. I think we have to build off the monitoring sites. The committee members might want to chime in. Anybody want to add anything?

MR. GREENBAUM: Questions for Jon?

MR. VANDENBERG: Jon, I just got a brief comment, I think, is that, as Dan Albritton showed, there is a sort of sliding scale from 850 plus a couple of hundred compliance determination sites down to the 300 chemical speciation, and then the 5 to 7, whatever the number is. From your point of view as an epidemiologist, what is your sort of range of interest when you move up that towards the payment ones? Do you have any particular interest in those, or does your interest fall off quickly when you move past the supersites through the chemical speciation?

MR. SAMET: I mean, maybe, maybe not. I mean, this is a tough problem for observational studies which is...you

know, I mean, in a sense, I...I mean, what we have done with the particulate matter thing, it is still a complex mixture problem renamed. I mean, what we are really trying to do is understand what aspects of particles may be affecting health, and that could be, you know...I mean, we have seen all kinds of things, size distribution, number of counts, acidity, metal content. There is a big array.

So, I think if we could have efficient strategies that, in fact, took advantage of the multiplicity of sites, you know, maybe doing the kinds of things we are doing with HEI funding, I think there could be a broad epidemiologic use of those data. Okay? Because the heterogeneity would allow us to begin to answer questions about what aspects of particles might be important. Those would be ecological studies.

Going down to the other end at the very focused sites, there we would have to, I think, design much more targeted studies, testing hypotheses that would perhaps, you know, build off the toxicology and what else is coming out of the epidemiology and use the more detailed data. We probably would be approaching things at the individual level.

So, I think it could all work together. So, I don't think we should lose interest, necessarily, at any level. Probably at all levels, what would be helpful would be to try and have some understanding of how well we think we are estimating population exposure, and some of that will be coming out of, you know, the HEI work, any work that follows up on the Academy's recommendations, but I think that becomes more and more critical as you go down to more detailed monitoring.

MR. NEAS: In the epidemiology community,

aside from yourself and the members of the Academy, there seems to be a turning away from epidemiology in the short term. I am wondering how then you will...the exposure assessment people really know that they are on the right track of a toxic agent without some short-term epidemiology that is temporally correlated with the exposure assessment. If you don't have some health assessments going on as you do this in the next two years.

MR. SAMET: But, see, the...

MR. NEAS: With the toxicology, do we really go to town on the toxicologists to offer up the magic bullet?

MR. SAMET: Depends on which toxicologist you ask, but...no, I think if one...the short-term, you know, the initial monitoring recommend...the initial exposure work recommended in the Academy report is more oriented at PM than at sort of the toxic component piece, and, you know, because I think, in part, we are not, you know, ready from either the epidemiological side or the toxicologic side to have enough target hypotheses. I mean, we could probably lay out right now four or five reasonable ones. I think it would be premature to rush into major epidemiological studies.

You and I might have a disagreement about how and when epidemiological evidence, observational evidence, is going to help us sort out the component question. I just don't think we are ready to do it yet. I think this is a tough question to answer using observational data, and until we have some better ideas about what it is we need to monitor in doing human health studies, we are not going to be able to sort out the question.

MR. NEAS: No, I am in agreement with that. I just think it is premature to assume that while we are hesitant, that

they should be allowed to go ahead, that they are on the right track without...

MR. SAMET: Well, you probably know more toxicologists than I do.

MR. MAUDERLY: I have a comment on that. I think, first of all, what Jon is expressing is that we do have some laboratory work underway that seems to be pointing some directions, but I think more important than that is to sort of set our personal discipline aside and look at the picture. And the table that Jon showed, the one in the orange book, doesn't say there should be no epidemiology any more than the report said there should be no monitoring.

Now, both things have sort of been taken a bit out of context. I mean, there was funding for epidemiology in the first year of that table. So, I think what the committee was trying to do, rather than turn switches on and off, was to portray...a portfolio, I think, is a useful word...of sort of varying emphasis that would be staged to make the best total progress. I think we all need to keep that in mind.

I think that, you know, looking at these different issues and saying, well, the committee said we shouldn't do this or we shouldn't do that, that is not really what the committee's intent was.

MR. LIOY: I think this, put another light on Joe's point of view from the exposure vantage point is that before we want to apply more detailed analyses to epidemiologic studies, we need to know, basically, what targets to focus on, because I think the exposure perspective will be drawing upon the results of toxicological studies as your silver bullets.

In the meantime, the issue that the epidemiologists have raised in the first set of studies was that there is a sensitive subgroup of the population that are associated...that have associated exposures to particles that will lead to dire health consequences. At this point, the exposure community can go out and look at these sensitive populations to ensure that they are being exposed to outdoor air, and all this works in conjunction with more epidemiologic studies.

This is not an either/or, as Joe said. It is a combined effort to become more focused and gear up and deal with things in a way that we find the right targets.

MR. DEMERJIAN: I would just comment. Paul, wouldn't you agree that if that were the primary thrust that you could design a program of special study to look at that problem, define it for a particular set of areas that are representative of the kinds of source distributions that occur in the atmosphere, and then you could pass that data along and walk away from the problem if you didn't have the requirement to have to manage this problem down the road?

MR. LIOY: Right. Well, you have to manage the problem, in other words you have to deal with the total conceptual design.

MR. DEMERJIAN: I see two paths of activity here that we need to address, that which is going to help elucidate and push forward the question of effects impacts and that which is needed to give guidance and, presumably, make progress in how we mitigate the problem.

MR. LIOY: I agree. That is why I said before

that supersites have a number of presumably site specific problems.

MR. GREENBAUM: I think people understand that. There was also, I mean, on that chart Jon put up, there was work in both epidemiology and in the sort of whole monitoring and source-receptor relationship area for an immediate need for investments in developing the tools and developing some of the things that are necessary but recognizing that as our toxicologic and other understanding improves, we are going to want to invest larger amounts of money in those areas, full-scale sort of receptor modeling and full-scale epidemiology studies and other things. So, I think there was an understanding of that.

The challenge, biggest challenge is to see that there will be sustained investments over the periods of time to actually see that all happen beyond three and five years. But we're working on those things.

MS. HERING: I think, you know, as we look at monitoring that is going to support epidemiological or health effects studies, I think yes, we don't yet know what the culprits are or who the culprits are in particles, but I think we know what are the major characteristics of particles, and I think we need to look at designing measurement programs that, at least at some sites, are going to address all, you know, the major things that we can identify.

I mean, we are talking about now going forth with speciation measurements that we will hear about here momentarily, but that is not, you know, the only thing that you need to be concerned about. Remember, there is a lot of health hypotheses which have to do with particle number, particle size distributions. There has been no mention of measuring these other than perhaps at

the supersites. And, also, the time variation in particle concentrations even if it is only the time variation in the total. I think that we need to look at what are the overall things that characterize particles, or I don't think we are at the point of bringing simultaneous size and composition, but we are at the point of being able to give you physical parameters as well as chemical parameters on the aerosol, and we need not forget that.

MR. GREENBAUM: Susanne, I am going to ask you to hold that thought for a minute. When we get to objective 1 which is determining health effects of exposure, we are going to get into that hopefully in more detail in a moment. Did you want to...

MR. SAMET: Well, the only comment I was going to make, and this is, in part, what Susanne said, just from the point of view of observational evidence, let's say there are five things that we are worried about with particles- mass, size, acidity, some index of metal content, and something else, whatever it is you are worried about, organic acid fall-out, something, whatever you want.

So, if we wanted to approach and, in an observational sense, try to understand what it is about five things that affect health, that is not easy, and that is not easy in a toxicologic context either, because you begin to have a pretty big measure of possibilities. And I think we have done...part of the reason why we really think that we need to be as, you know, targeted as possible when we come down to, you know, observational studies is so that we can measure best what we think we need to measure and design measurements accordingly.

MR. GREENBAUM: Okay. Well, now we can move on to Petros.

MR. KOUTRAKIS: After the meeting in Seattle, someone came and asked me, well, next week, you have to give a talk, and this sort of prepared me because I found out I had to give a summary by today, so I did not get a divorce this weekend, but if this is going to happen, I am sure I am going to have a divorce by the time it's all over.

Anyway, I tried to highlight some of the main points of our meeting in Seattle. As you know, in response to a request from the scientific community, EPA was able in a very short period of time to put together to plan a speciation network. Basically, the main objectives of the speciation network is to collect compositional data so EPA and the States they can develop control strategies and be able to evaluate these control strategies.

So, basically, there are two primary objectives, and, also, there are two supporting objectives which is to the extent we are going to spend money and collect all these nice data, can we use them for health effects studies, for exposure assessment studies, for data supportive of epidemiological and toxicological studies? Also, can we use these data to enrich our data set on visibility?

So, although the main drive of this network is not going to affect the visibility, we would like to develop a network without jeopardizing, of course, the network that is going to be able to provide some information to the health and the physical science community.

We, EPA, has proposed to put together a large network, 50 sites, that would be the trend sites. These sites would be used to establish year-to-year concentrations for different species and see, you know, how well the different control strategies are doing and

also 250 sites which would be more sporadic. These would be in the fixed places surrounded with more or less the same technologies, with the same protocols, whereas the spatial sites would be more flexible. The States could be creative, and these sites would be implemented or used to develop SIPs for the States.

The EPA has done a lot of work. They have run around. They have talked to the States. They have learned a lot from the States, because these are the users of the data that they run, the network that they will use the data. They have established a working group. Also, they went to DRI and asked them to do a kind of criteria document for speciation. They took that criteria document, and they translated it to a guidance document. They asked the experts...experts, I use that for emphasis of course, but the experts. The group includes Bob Stevens, Joe Landau, Laura Gontero, Jack Cooper, and who is the...

SPEAKER: Tom Cahill.

MR. KOUTRAKIS: Tom Cahill. Thank you very much. And they asked us to review this document and get together in Seattle at the last minute and think about it.

Now, we realized that...and we acknowledge the fact that this network, it is a little bit different than the other networks EPA has implemented in the past. It is more flexible, which is good, I think.

It allows the States to design their studies to the extent they can address specific questions, and, also, it is flexible longitudinally, because if we have health effects studies after three or four years or three years, and they tell us we need to measure dysprosium, if that is the thing that kills the people, the speciation

network would be able to adjust and include these measurements. Or if there is new evidence that we don't know how to measure aluminum, we can go back and adjust and change the sampling or analytical method. And I think that is very important as compared to the compliance network, the 1500 sites where we have to be very careful about changing things, because they are with the National Air Quality Study.

Also, the network is going to be cost effective. As new technologies emerge, as analytical or sampling techniques, the States will adjust to reduce costs. Also, the protocols, although it is going to be guidance from EPA how to analyze things and how to do stuff, the States can use different protocols based upon the human resources they have, based upon the type of analytical agreement they have and the money they have.

So, I think the characteristics of this network is flexibility and cost effectiveness which the panel felt was appropriate for this network.

Now, because a lot of thinking is already done, the panel really did not feel to go and micromanage, you know, what EPA and the States will do, but we felt that we wanted, instead of saying what can be done, we decided what questions we want to answer, because you can really go crazy. You have a big budget, and you have a big crowd, and you can put thousands of monitors, and John Bachmann likes colored pictures with, you know, a special variability of concentrations, and you can go crazy and raise millions of constituents, the physical, chemical, morphological properties, biological properties. You can do, and you can go also crazy with that.

And the question is, do we want, as a scientific community or as States, the EPA to spend our time for the next ten years and do that? And the answer, of course, is no. So, instead of saying what can be done, what kind of technologies we have out there and what we can do, we said what kind of questions do we want to answer. And this was the philosophy throughout the review, and I will try to tell you, you know, about some of them. Of course, we have to highlight everything and cut it out.

So, the first question we need to address is, what kind of information do we need in order to be able to do trends analysis? Okay? And the panel felt that if you use every six-day measurements, you might not be able to do trends analyses.

And I think EPA has to go back and the people from OAQPS to take some data and analyze them and be able to see what kind of data, you know, we need. Here is an example. Unfortunately, I almost missed my flight. I was trying to find some data from sulfate or fine particulates, but I was able to find only hydrogen ion which is a more difficult pollutant.

What we had done in this paper is we took data...we took a GME...I am sorry, for six months from May to...oh, this is four months, and we took daily measurements, and we created different data sets. We created one data set that was every day. We create two different data sets which correspond to every other day. We created three data sets that they go every third day, fourth day, fifth day, sixth day, and seventh day.

Now, we know the every day measurements. We took the distribution. We calculated the mean, and now we calculate the two means for the every other day, three means for every third day, four

means for every fourth day, and so forth.

We found that if you do every other day, the absolute difference between those two distributions for the real distribution, the every day distribution, it was about 2 percent. So, if you take every other day measurements, probably you will have an estimation of the average over that period of time which will be between zero and one and a half.

If you take every three days, you have three distributions. One was off by 10 percent, the other by 12 percent, and the other by 3 percent. And, of course, if you take every seven days, you can have one which is off by 40 percent, and you can have one which is off by 5 or 6 percent.

Now, this is the worst case scenario. We don't have the full year, and H+ is kind of funny, because it is very episodic, but I think it probably, for the different species, we don't have details, we don't have all that much data in front of us, but I think this needs to be done before we go out and set up, you know, monitoring that is going to give us a yearly average. Because let's say that we have a trend of 5 percent over 10 years. You don't expect that much. I mean, 5 or 10 percent, we'd be happy, and we are off by this.

So, this is some data analysis that needs to be done, but the panel felt that probably the frequency of the measurements might not be enough, and also, we felt that if you do source apportionment studies, people who are in this business and they believe source apportionment...I will tell you more about it later...if you have 52 measurements...okay...and you lost some of them, you have a data set which is very limited. So, you will not be able to do a good application if you have poor data points for each site.

Another thing is that...and I think that everybody acknowledges...I palled around with epidemiologists, and, by affinity, I know a little bit of epidemiology. If you collect every six days, you might not be able to use those data for longitudinal studies where you do times series analysis. Is that a correct statement? Can you use every seven day data, every six day data?

SPEAKER: Well, you can, but you need to multiply the time you...

SPEAKER: You need ten years of it.

SPEAKER: It is just a power problem.

SPEAKER: Right.

SPEAKER: But you need many more years of data.

SPEAKER: Many more years, yeah.

SPEAKER: If you have every six days, you need six times the length of the...

MR. KOUTRAKIS: Okay, but the panel did not have any epidemiologists, but we felt that probably this, it is better to have more frequent measurements as compared to less. So, basically, how we resolve these issues. Basically, you can do two things. You can stick with the every six days, and you take into consideration what the consequences will be. You can use the same sample and instead of going one day, you can do seven days measurement. That uses a low rate and use the same sample. If you collect seven days, there is some technical issue that is important here to be addressed.

You can use continuous monitors. We don't feel that we will tell EPA what to do. We, throughout the review, we felt that we

should raise the issues and let EPA and the States to consider the human resources they have, the monies they have, the questions they want to answer to make those decisions.

Some people, at the end of the discussion, they said, well, don't we have to ask. If you go out and do 50 sites every day, you will destroy our spatial, you know, network. We do 250 sites. And I felt sorry for them, but being in the plane for six hours, I thought about some things here, and I said do...the same question, do we really want to have a map of the United States that we have concentrations everywhere and we do peaking and we do modeling, or do we want to use these spatial studies to answer specific questions? And if the question is we want to have mapping of all United States, okay, we need about 3000 sites, and let's put 3000 sites. But I think the question is we want to understand the contribution of specific types of sources so we can develop some control technologies, in that case, we can have a focus on different studies rather than just doing spatial studies.

And in order to address this question, we have to go and think about very simple things that...most of the physical scientists are not here, but I will just bring them up...that fine particles are mostly secondary. 80 percent of the particles, in some cases, can be of secondary origin.

The distribution on a regional and semi-regional scale of distribution of particles is very similar. In other words, if you go to New York...it is a bad example, because there is so much happening in the buildings there, but if you can go into Philadelphia or Washington, and you could set up sites throughout the city. You will find they are within noise. And you could go up during the summer,

you would find there is a difference.

They are highly correlated. When Washington goes up, Boston goes up. So, can we use these similarities on a regional scale in such a way that we can really have cost effective spatial studies...spatial networks?

Of course, this is not true if you go to the West and you have a wood burning community, you have a valley, you have some specific source of meteorological problem there, but there you can do more intensive studies.

The other is so, basically, if we really analyze what we know so far from the limited data we have here, we feel that we should really do spatial viability or these exercises and focus on population. We don't want to go where people do not exist...we want to go where people exist, to know their exposure, to know the epidemiology.

We should focus on source type. The question is for this level is that do you really want to compare power plant A versus power plant B, Volkswagen versus Mercedes, or do you want to address the type of sources and try like, you know, coal power plants in coal, or car, or wood burning, and if that is the answer which I think it should be the answer, you really have to focus on source type rather than just going and chasing hot spots.

I think the States, they really have to, they spent a lot of time here, and they have learned a little bit from the ozone that we're...this is not CO, this is not NO, we are not chasing bus terminals, and we are not chasing, you know, a wood stove. What you do, you deal with types of sources, and you really have to have limited sites but which provide you a lot of information as compared

to many sites that you cannot really learn that much.

The same...how am I doing with time, Dan?

MR. GREENBAUM: About five or so.

MR. KOUTRAKIS: Okay. The same thing with the data, the target analytes. Again, you can do many analytes, but the question is how you are going to use the data.

Here, we put three uses of the data which really help us to focus what kind of analytes we are going to use. They wanted to measure major components of fine particles, and also, you want to do mass closure for quality control purposes. Also, qualitative source apportionment.

So, in other words, if you have 10 ug/m^3, you want to know what is the measure performance, if you did a good job with the speciation when you compare the speciation data versus the FIM data, and, finally, you don't want to do power plant A versus power plant B, because the methods and the tools, the statistical tools we have, the analytical tools we have right now, we probably in a few years will be okay, but right now, we cannot address those questions.

So, the source apportionment, it will be qualitative. It will tell us we have sulfates 30 percent, we have nitrates 40 percent and organic carbon versus elemental carbon. Fortunately, in a few years, we will have better techniques that will tell us more, but right now, we don't have techniques that really can help us to do this here. Maybe some scientists can do that, but then again, it might be difficult.

We also gave the flexibility...I mean, the guidance gives the flexibility to the States to do any kinds of...I am sorry. In order to achieve this, they will do elements for soil attribution and some

source tracing; ions, sulfate, nitrate and ammonium; and elemental and organic carbon using computer technology and those computer methods available right now. I don't have time to go into that.

But there is also, depending upon the type of source you have within a State, like, for instance, in California, I think the fluoride is very important. The East Coast does not think so, and vice versa. Hydrogen is very important for the East Coast but might not be important for California, and to analyze this is very expensive and very tedious.

So, there is flexibility for the States based upon their needs, based upon their technologies. They can use microscopic methods, do a single particle analysis, can do organic carbon speciation, particle size distribution, or use continuous methods. But these are optional analytes that will depend on the source in a State as compared to force the States to go out and do this.

The third big issue here was sampling techniques. EPA already has contracted similar cultures that they can produce variables that can be used for speciation. The States feel that they proved something has been there for a long time, and they wanted to have this be considered as one of the three options. So, we will have four options. The panel feels that if some modifications are done to improve sampler, it could be also one of the candidates.

Also, there was a lot of discussion here, because the panel strongly felt that the speciation monitors, they have to have the same size characteristics and ion characteristics as the FRM. It does not have to be the same, but if you would talk about mass closure and comparing speciation, species versus mass, you really have to be able to collect the same mass in the filter.

Also, we thought that in order to validate these methods, we have to use some reference methods. For the mass, it is the FRM. For the ions, it is the existing and well-tested parameters that EPA has, and for the carbon, again, we use the FRM with a filter and dose measurement.

The sampler selection, we have that, unfortunately, time is a problem, but the panel felt that the time that EPA proposed that you would go out and just use them and do something fast and do comparisons was not good. We feel that if we need to postpone or delay five or six months, we have to do that. We feel that the ORD involvement is pivotal to this effort. We think that these samples, they have to be tested in laboratory in the field by ORD, and based on that, we did not want to make a decision what sampler to be used, but we made a proposal for what kind of criteria you use in order to select the sampler.

We felt that the value of the network will depend on the quality of the data, and we don't want, a few years from now, to argue about the quality of the data. So, it is better up front to be able to apply some performance criteria and make your selection.

Finally, it is the last...I am not going to go through this, but one point I want to make sure is that there is a relationship between the speciation network and the supersites for two specific reasons.

First of all, the supersites, since they are going to have a lot of resources, they will do a lot of measurements of size and morphology and chemical composition. We want to use the supersites as sites to test the performance of the speciation monitors, and it would kill two birds with one stone, and I think that

would be important. So, the supersite platforms will be used to evaluate these methods.

Also, in order to do a source-receptor relationship modeling, we need to have the support of sites around your supersite, and we feel that, you know, the speciation network will provide that spatial variability around the supersites, and we really...so, the supersites will benefit from the speciation network, and the speciation network will benefit from the supersites.

So, basically, this is a highlight of the two days' discussion. I will be happy to answer any questions you have.

MR. VANDENBERG: You said at the very end there that the sites, two to three years may be enough. What do you mean by that?

MR. KOUTRAKIS: No, no, no. This is for this afternoon's discussion.

MR. VANDENBERG: Oh, okay.

MR. KOUTRAKIS: I decided to use one transparency for two talks. Are there any questions?

MR. SAXENA: In this document, I think, looking at this, was there any discussion, I mean, you know, was basically improve new methods for counting, but did the panel feel that was adequate, or...

MR. KOUTRAKIS: The panel felt that we don't know how to measure carbon, but, also, we felt that we don't know even what is out there right now, there is no guarantee that we are going to do good measurements. So, we felt we go with what we do now in the group. The only difference, we use only one coarse, because we don't believe that these extractions are correct. If in six

months or eight months we know that there is this method that works, we would incorporate that, and if in two years we find out that something else is better, we would use that, but the panel felt that if we look at the problem with the carbon, just stick with the group so in case we have something which compares with the data, we can look at that.

MR. GREENBAUM: Other questions?

MR. SCHEFFE: Let me just throw something out. Obviously, we are in a little bit of a bind with the sampler selection, and we want to...we want to have, basically, for the trend sites, pretty similar sampling technology around, and then the panel went even a little further, saying that the sampling technology, you ought to be able to relate that as well as possible to the FRM.

And it was kind of interesting, because I was actually trying to push that we didn't have to be that concerned about what the FRM was measuring, that we have gone out on a limb with an FRM to pick up an indicator, and with the speciation network, our truest intentions are to capture what is really out there in truth, but with the recognition that you have to tie these back to SIPs, and you run into that kind of dilemma.

But one of the implications of...and Petros did an excellent job of really summarizing what went on in that meeting, but one of the implications there, though, is, you know, the extent of the testing program for the different samplers that are there, and, Petros, you might want to give us a little bit of your sense in terms of what this testing program would be, and I have John Bachmann here saying oh, my goodness, we are behind for two or three years, and I don't think that was really the sense of the panel by any means.

MR. KOUTRAKIS: No, no, we offer some alternatives. We said that your first sites, they can be the first sites, or the trend group can be your field sites for testing. So, we are very sympathetic with what you want to do, but also, we felt that, really, you can imagine if the monitor you select reads 50 percent of the mass as compared to the FRM. I mean, that would be a disaster. We cannot do source attribution.

So, I think ORD has to be involved. They did an excellent job with FRM. They spent two or three months. In two or three months, they did the field tests and, actually, in that panel, they asked a mass spec expert to help me to draft some criteria how we can do that study. So, we recognize the constraints here, but, also, we cannot just close our eyes and say, well, let's use whatever.

Yes, Rich?

MR. SCHEFFE: One other aspect I want to comment that is sort of a big output of that meeting. Another way of looking at...you know, we had a one out of six day suggestion for a sampling schedule for these trend sites, and I think, collectively, the panel felt that you don't want to risk quality data for more locations in space, and I think we were really coming from that aspect, and I think the push there was very much to have as much daily, as much continuous information as possible.

And we had also talked about using continuous methods, perhaps, to supplement the filter-based methods. I think we are all concerned about doing filter-based methods on an every day basis.

So, is it fair to say that that fell within that, that when we are talking about going to either every other day sampling or daily sampling, we are also talking about complementing, perhaps, some

of the filter-based methods with continuous methods to fill in some of those gaps?

MR. KOUTRAKIS: As I mentioned at the beginning, we really...we would like to talk about the issues and let EPA deal with the States to solve these issues rather than just tell them what to do, and we tried to stick with that, basically, but yeah, the obvious, the obvious way to address this issue is to use continuous monitoring.

Any other questions?

(No response.)

MR. KOUTRAKIS: Thank you.

MR. GREENBAUM: Thank you. I think that last point, actually, raises something I meant to suggest in my introduction, which is one other I think important sort of almost unstated output of a process like the one we are going through, in my view, needs to be some mechanism for fostering enhanced partnerships between the various research communities, EPA, and the States, and add and the State with emphasis.

Jeff is here, and we only have one State perspective, but I think, in the end, how these individual sites or things get put together or how we work are only going to be successful when we have active State engagement and active partnerships developed among a variety of different people, including the States and the research community. So, we will look forward to sort of making sure there are plenty of State people at our July workshop.

I am going to actually suggest, sort of take a quick poll. This would be...we have you locked in this room all day without...there is a break for lunch, although I believe we are

actually having lunch brought in now, but I was going to suggest that perhaps we should see if people would like to have a brief break now before we go on and then...I am seeing some nods around. Why don't we aim at a ten-minute break? The restrooms are just down the hall that way, and then we will try to convene back here no later than ten minutes.

(**WHEREUPON,** a brief recess was taken.)

MR. GREENBAUM: All right. Two things I wanted mechanically before we go on. First of all, this isn't mechanical, but I neglected to thank EPRI earlier. I guess they provided some drinks, and then are going to provide lunch as well. So, thank you for that.

And secondly, I have been informed that there is a...there will be, at lunch time, at least one other phone readily available or can be made available if they have to make phone calls. We can do that.

But with that, we will try to get down to the sort of task in front of us, having been appropriately introduced.

MR. ALBRITTON: What we wanted to do here was to very briefly summarize the nice input we got from many on the draft that went out prior to this, and we got both nice general perspective from the variety of perspectives in this group. We also had some very, very informed and specific information about types of measurements, locations of sites, and all of those will fold into it.

All of you should have two things. You should have gotten the updated draft which did reflect the comments that were sent in, and, secondly, at your chair this morning is a copy of all of the detailed comments that came in from the various members of the

steering committee. So, that puts the updating process documented for you, and what I wanted to do here was actually now begin to focus our discussions on the specific points that had come in that zeroed in on the draft of our concept paper as well as the nice set of comments.

A rough outline of the structure of the document and the concept paper that we are aiming toward, as you remember from the morning, the picture would be based on comments here, we will produce another updating of that and get...we will come back to you to look over, as it goes out to the attendees at the July workshop. So, this would be something specific that everyone will have in hand at the July workshop so that we could immediately move to talking about specific things.

Later in the agenda today, we will get to the structure and agenda of that July workshop, but before we do, I wanted to walk through the main points within the concept paper, and after a brief statement of the issue which we are gradually improving with your comments, what is being presented to you now as the objectives of the special purpose research sites, the supersites, that there be four objectives considered as the rationale for having those sites.

The first one of them and perhaps a real crucial one, the thing that I think provides the most near-term information from what I have heard this morning about clarifying hypotheses as to the cause of the health problems, is to view the supersites as key to the determination of the exposure that is very relevant to health effects. The high resolution measurements, the wide variety of chemical to physical variables that can be made, the more input we can get from the health community as to what those measurements, locations

ought to be, that is a key guideline for what those setting up the supersites will take in mind.

So, first objective is that they ought to, as much as possible, clarify the various aspects that can be underlying what the health problems are.

Secondly, of course, from an implementation, a regulatory implementation standpoint, the clarity with which one can link source and receptors have a key aspect of implementation over the years. So, a second aspect of the supersites is to try to do the kinds of measurements in the kinds of places...and we heard comments like regionality as opposed to hot spots. This source-receptor clarification is an implementing objective of the supersites.

This is very much a characterizing objective to help test trends, the epidemiology studies, the other. This is very much of an implementing objective.

Then, third, a point that many made in their comments, this is a long-term problem. A long-term aspect that occurs in any environmental issue is the accountability phase, namely, is it improving? Is it improving for the reasons we thought? Is it improving in the most crucial places?

Over the long term, the supersites could help with evaluating our understanding of the issue and, indeed, the effectiveness of some decisions that lie ahead by seeing the environmental responses.

Fourthly, and this was brought forward by several suggestions and has been mentioned again this morning, is that these sites offer the flexibility of evaluating and testing various new types of measurements and monitoring efforts there. So, we have

added to the draft set of three objectives here, we have added this cross-cutting objective to say that here is the place for the intercomparisons, here is a place for the evaluations, here is a place to be near a chemical speciation site or near a mass site to cross compare and learn in a very specific way.

So, one, near-term characterization, as the Academy report pointed out, data that can help identify the toxicological, the epidemiological aspects of this; secondly, in the implementation phase of doing something about the issue of source-receptor relations; and then, a thing that is often in many issues not thought of up front is to be prepared to evaluate the effectiveness of strategies; and then, fourthly, to have the flexibility at these sites to actually enrich all three of those preceding ones.

What we had asked for and got numerous suggestions in detail is that for each of these, from the perspective of you, what are the key science questions that relate to determining exposure and dose to help understand responses, what is actually to be measured that would best help each of these, where would one have some high priority emphases, and, as already noted this morning, are we thinking one to two-year hypothesis testing, or are we thinking of a longer-scale set of measurements?

And we got very good input to these, and the draft you have reflects those. So, this represents our status of thinking at the moment, but very importantly for the objectives of the research sites, there were a number of general characteristics pointed out by the group that made comments.

The first question is the sociology of monitoring. I think my atmospheric colleagues would probably agree with me that, a

decade or so ago, we thought this was actually...that is, routine monitoring was what we named it...routine monitoring, and I think now in the atmospheric community, we realize this is probably one of the hardest aspects of our research.

Cutting edge measurements day after day, week after week, year after year, and building in an analysis of those so that output and changes can be made in time is probably much harder than theory. It is much harder than process studies, and I think we have gained a healthy respect for the difficulty of doing that.

And that was for atmospheric chemical constituents, and now, we are thinking of particles that have multiple dimensions and numerous subscripts. I think as we characterize these monitoring sites, to have a reasonable set of expectations and some founding objective will be very, very important. Otherwise, we start big, and we end quickly.

Secondly, a thing that was common in many of the comments was, of course, the co-location aspect, and that occurred in two ways, not just the obvious co-location of the hierarchy of sites that I outlined earlier but co-location with health studies, and that, I think, is the thing that this collective group is uniquely equipped to do, and I will come back to some suggested mechanisms of doing that in a moment.

So, co-location from an atmospheric physical standpoint but co-location that can provide the needed input to health-related studies.

Clearly, and it was already alluded to in the chemical speciation sites, the protocols here will almost not be protocols, and that is it will be a rapidly evolving set of looking at various

phenomena.

Perhaps one of the hallmarks of these sites would be rigorous and tested intercomparison between methods and then publishing those in stand-alone research. Also, given that there could be a sequence of measurements at these sites, it will be very important, as many have commented, to outline a limited sequence of policy-related objectives, namely, how good does the standard reference method compare to method A, method B, and method C, which are much more labor intensive and more research intensive? A very little manageable nugget of an objective to be done at one of these sites.

Then, lastly and most importantly, because I think in the past, at least on the atmospheric side, we have actually failed at this fairly miserably, and that is taking data is not the end result, gaining insight and understanding is the end result. So, to build in up front into the funding mechanisms, indeed, a systematic data appraisal, analysis, and publication scheme associated with this endeavor is a chance to crack the paradigm of what we have struggled with in the past.

Then, two last items that would represent perfecting. It was deemed useful that, in going into the July meeting, if we had...and you have an example of a format in your handouts...if we can inventory among ourselves, not just EPA, not just government agencies, not...but also States and private sector what is out there in thinking or what is out there already in a plan to put a site at X and Y, if we had data sheets on these...and you have an example that Jim Meagher prepared...if we can bring those even in rough form to the July meeting, it is a data source that would help think of step one,

step two, and step three.

It also occurred to several of us that if we can, similarly, provide a nutshell inventory of the major health-related studies, now we are beginning to have a layout that can show where the overlaps are planned, where the overlaps don't exist that maybe should. So, building on what John Vandenberg had started and others in terms of an inventory of health-related activities, I could see these two appendices to our effort ending up as a very, very valuable data source for planning.

So, this is the status of where we think we are with the comments and help that we have gotten from this group, and it would be at this point where we would welcome any comments or suggestions or input from this group, have we captured the major parameters here, have we got the shape of this right, before going into, after this summary, going into it objective by objective and getting details from you on how to improve each of those.

So, I will open it up to that type of question and comment.

MS. HERING: I just...I really like what you have done, and just one comment. I see that the research monitoring sites could feed into the speciation sites that we heard about earlier, especially with the talk about, well, we would really like measurements every single day, but we really can't afford to do them, what do we do to supplement those other days.

Initially, you know, measurements are often in the research phase and can turn into more monitoring type methods which then could go over to maybe some of the speciation sites. So, I think there is some synergism there.

MR. ANLAUF: What you have described is

pretty well a U.S. program but not to be neglected, and I don't know if it should be specifically stated...maybe it is implied...that there has to be an international aspect. Consider, for example...I speak for Canada...to consider the border a seamless way, because the air doesn't know a border. So, whether the flow is northward or whether it is southward, there is a large section of Canada which sort of extends into the U.S., and the flow is across that so that all sorts of effects, health effects due to particles, time-wise if you were to study, say, Michigan, well, Ontario is in between. You are missing a location fully. Somehow, we would like to see that rolled into that.

MR. ALBRITTON: Absolutely. I am glad you brought that up, because that is a...I mean, this is a comp...we want this to be a complemental picture. And, secondly, in terms of these two inventories, perhaps we can get your help on getting the insight of what already is being planned by Canadians so we can work it into this overall picture. It should be a complemental result.

MR. ANLAUF: My second thought is sort of in addition to that, and that is by rolling it into whatever is going in Canada, whatever data is produced there...and they have a big history of epidemiology...I can't say the word...the health studies in that area in Ontario, Toronto in particular, whatever we do, it should be in concert with the U.S. so that there isn't, ten years down the road, some data incompatibility and then we ask ourselves why didn't we do it the same way ten years ago.

MR. ALBRITTON: Yes, if we struggled a bit, as we did, about the discontinuity in ozone across the border, we are going to really stumble on this if we don't get up front work like you are describing. So, I am hoping we can get foreign suggestions for

the July workshop, that we bring in not only the Canadian health aspect part, but also include some other countries' experience.

So, indeed, the role of NARSTO in this is to make this...to try to continually raise the point that this is a continental phenomenon.

MR. FELDMAN: Dan, my question is with respect to the characteristic of reasonable expectations and the objectives that are very lofty objectives and how those mesh, and maybe it is a question of time, but, I mean, they are very tough things to do. They are things that we don't know where the answer is going to come from to the objectives above.

So, what would be a reasonable expectation? Is it that it is something that takes a certain amount of time, or is it something that we are going to try to do this but we may not do it? I am not quite sure how that...how those two mesh.

MR. ALBRITTON: Yes, these are lofty, but they have subscripts which you can say...let me pose one. Let me hypothesize that, with effort and cash, the community could put in place three time-of-flight chemical speciation of individual particles apparatus. Suppose we could put in place three. I know we could do two. We might do three.

From a health perspective, where would you like those three to be? I give you the suite of elemental analysis of an untouched particle. That would be one of the little items under this objective that would be a practical place to intersect the health and the atmospheric communities. So, there is an example idea.

You could then list others of that type, very practical questions, and I know of one that is going to be put somewhere. How

can you do it to get the best health payoff?

You can do subdivisions of each of those, and I would think that, over time, you then can see the sequence of understanding that would come from the subdivisions of each one of those.

Jon?

MR. SAMET: I just have a comment about your objective number 1. I think it needs to be opened up a little bit. You say determination of exposure relevant to health effects, but we are talking about a concentration monitoring network, and, in fact, if I were to make an appeal at this point, it would be to say that when a network is set up or whatever is set up in these sites, we should know what the relationship between concentration as measured and exposure to people is.

So, you have telescoped there, and I think, in fact, I would say determination of concentrations with known subcharacterization of the relationship between those concentrations and exposures of people, because, otherwise, we can't get to health effects.

MR. ALBRITTON: Yes, you can help us put the people words into that.

MR. SAMET: That is right.

MR. MAUDERLY: Not a criticism of the four items that you have there, because they are written such that you can include almost anything under them, but just a perspective, and it is a very frustrating one to all of us health types, and that is that, you know, we are chasing particles. We are talking about a PM monitoring strategy, and I think we have to remember what we know.

We are interested in health, presumably, and what got us here is an association between health and mass, and we don't want to lose that perspective.

Now, I don't find that satisfying, because we know that not all particles are alike, and we can feel very clever in reiterating that. Some are bound to be worse than others, and, you know, but what got us here was this correlation between health and mass in widely diverse places, and the belief is that we can understand that better if we understand more about the particles in the air, but I exhort us to keep in mind that the real question is not just that. The real question is, what is it that seems to be well correlated with particle mass that is also well correlated with health? What is it? It may be the particles, and it may not.

MR. ALBRITTON: The co-pollutants.

MR. MAUDERLY: The co-pollutants.

MR. ALBRITTON: Absolutely.

MR. MAUDERLY: Absolutely, and the fact that this signal was all the more convincing because it appeared similarly in very diverse places.

MR. ALBRITTON: When you know the makeup of particles are actually dramatically different.

MR. MAUDERLY: Which tells us that co-pollutants are important, probably, and it also tells us that when we site these places, they ought to be sited for perhaps the greatest diversity.

MS. HERING: I would say that if you look at how compositions across the country may be similar, the organic fraction is what you are going to be looking at, the organic

carbonaceous fraction. That is the part that is...I mean, the sulfates and nitrates are quite different across the country. The carbonaceous fraction is probably not that different.

MR. ALBRITTON: So, it is something that clearly should be emphasized in terms of understanding that difference. Jeff?

MR. COOK: In regards to number 3, I would like to see as much as possible if it could be directly related to air management. I am wondering about the idea of how long these supersites would be in place. If we are talking about trends, we are obviously going to be talking about five-plus years before we can get any kind of a trend, and is that a reasonable expectation for us to be looking at?

Then, secondly, if we are looking at four to seven sites, trends are going to be limited to those areas, and, well, you are lucky if you are in that area, unlucky if you are not.

MR. ALBRITTON: Let me make a comment by case study or answer by example. And your question is a very good one. How do supersites relate to number 3? Quite clearly, evaluation is a long-term exercise. I can think of one case, and it relates to your point as well.

With the efforts of many, there will be a lot of mass sites, compliance sites which will be measuring the item that is current with U.S. law which basically is, as you pointed out, mass, a mass-based measurement. Suppose in the next five years, we get an answer to Joe's question, and that is we find something, first of all, there is an element in that mass that the toxicology shows is a really bad actor. That is a very policy-relevant point.

Secondly, there is a co-pollutant that seems to really exacerbate the effect of that element, and, therefore, it is really a two-issue problem. It is maybe one that crosses two regulations.

And suppose, thirdly...and I think these are plausible...suppose, thirdly, we don't really know how to monitor well the individual element that is discovered to be the cause of the problem.

I would argue that the supersites can contribute to solving that question very, very well, and that is they may have helped discover what the elements are, but, secondly, they then would allow development of techniques that could be honed for a regular monitoring of that element, and, thirdly, by identifying the co-pollutant, they have then prescribed how the next generation of compliance monitoring is going to have to be done. Then they shut down and pass that to a regulatory entity.

I would argue that that little hypothetical discovery chain is a decade, and that is a supersite advantage.

MR. GREENBAUM: And I might also...I think there are two other aspects. One is that in thinking about siting these, it seems like a lot of thought needs to go into relative, as best we can at this point, sort of identifying a representative...and I will leave that to be defined...set of sites which even if you weren't continuously operating those over 20 years, which is really what you are going to need for evaluation in some ways, in all aspects, you would sense that, over time, you might maintain some things at that site, you might amplify some things, you might change some things, but you would be creating a track record of information at that site that then gives you...that series of sites that gives you a power over

time to come back to those sites and do other work.

The second thing goes back to the point that Petros made about the routine speciation...the trends speciation sites and their relationship to FRM. I think one key element here is a tension for us between regularizing everything so that, in fact, you can say at a speciation site or at some of these supersites there are comparables.

So, you can sort of say whether this site is representa...whether the FRMs in some area around these sites are somehow an indicator of what is going on in the air in those sites. You need to have some consistency, some ability to compare those very carefully.

On the other hand, you want flexibility at these sites so you can try new technologies and other pieces, and that is probably a major tension, but I would think we would want to make sure we have as much opportunity for that kind of comparison as possible.

MR. NEAS: From the epidemiology community, what we are hoping this...what we need...let's go back to Jon Samet's five agents, and we will include...where is Joe...co-pollutants as the fifth. So, you have four particle aspects and then the co-pollutants.

The problem is that they are all correlated over time. Even where you have no real particle acidity such as in urban areas, it is still highly correlated with total particle mass, fine particle mass. What we need are areas where these correlations, even if for only certain seasons, are lower than ones that we have seen in our routine monitoring.

MR. ALBRITTON: If you want to talk analogy.

MR. NEAS: But we need to be able to identify

locations where particular sources are absent or where the correlation has been broken.

MR. ALBRITTON: Let's go into that in more detail as we turn to that standard as it applies to monitoring. Yes?

MR. KOUTRAKIS: I think you did a beautiful job in outlining the problems there and give us some guidance how we can proceed, but I think I would like to step back a little bit and make a few points.

The first point is that I would like to, between the 1 and 4, to open the space and answer, you know, advanced questions. Who is going to do the data, and what kind of specific analysis are we going to do? Because, again, this is everything under the sun.

I personally think that this money would be spent in a better way if I see one study, an epidemiological study, that comes and has a hypothesis, it has a group of epidemiologists and monitoring people that they would test the specific hypothesis. And is part of that hypothesis going to be a solid monitoring network? A hypothesis can be part of the geographical...you know, it can be geographical, it can relate to specific species or populations.

Otherwise, statistically, we are going, we are doing...it is a fishing expedition. If you have ten monitors and each of them gives you six times the spec, then you have 6000 parameters. I guarantee that, in the end, you will find a correlation between mortality and one of these parameters, and this does not mean that there is an association.

So, that is one...and, number two, I would like to see a NARSTO time campaign, that they take their pains, they have a specific hypothesis. We do the same. We have a paradigm for

ozone, and we answer a specific hypothesis.

I am afraid that we are going too fast right now. I think the philosophy of this whole approach, it has to be checked.

We might want to spend the money to do specific studies rather than just go around and say here, guys, we have this big machines, study machines that will measure everything under the sun, why don't you take some of the methods we use and come here and do your studies. That sort of way we can design this case.

I would say here there is a question which I think is very important, and EPA or some scientific committee can spell this out. We are going to find a relationship between this type of sources and these receptors. Also, here is a beautiful example. And have a solicitation and bring the people from...and have an interdisciplinary group.

Right out here, you say you really make epidemiology...lots of people have as a second job epidemiology, really. I mean, everybody will take those data. They do know what we do. They do know...and they would just take it.

We really want to create a work fair for epidemiologists and monitoring people, where they are partners. We already do that in the compliance network. We did that with the speciation network. And the question is, as the scientific community, as the leadership in this country, do we really want to engage ourselves?

So, I would propose for the panel...this is beautiful. I mean, if I were to write, I would do the same. Just take one step beyond and say, we know, Bachmann, we have $20 million. Do we want to spend the money this way, or do we want, as a country, to do something? And that is the question I think we should address before

we go further with this.

MR. ALBRITTON: Thank you for that comment, because it takes you into the details, the meat of what is here. I would be delighted if, in our coming up discussion of here, we can get some suggestion hypotheses that limit the thinking of what the first step should be, take them to the July workshop, and see how they hold up, and from there, they are catalogued, and they are written out. That is a way that appeals to me very much and particularly from the supersite perspective. It is the testable hypothesis subset first priority items that we need to formulate some draft ideas from this group.

So, as Dan Greenbaum takes us through this, good examples of those that would help us think about how to form some hypotheses under each of these, take them into the July workshop is exactly what we want to do.

MR. SAMET: Can I try to rephrase what I think I heard Petros saying? I think he said in one model that you are not designing supersites; you are designing a population-based study. Okay? And that study is going to be designed to test our best views of what specific hypotheses need to be tested on particles right now. Maybe they relate to some four or five things. There is probably some number that a reasonable group would do.

And what would be designed would not be supersites to be followed by something later but an integrated research program which I think is what Petros was talking about.

There is probably another step in here where you say these are the best guesses about the four or five or ten things that we think hypotheses need to be tested about, and you go build the

population laboratory for future epidemiological research by picking the supersites so that someone can come along and design epidemiological studies to be based in those locations.

And the third thing which I think probably none of us want, which I think Petros was warning us against, is picking some sites and going to measure a lot of things and thinking that something will come out of it, which I think is your third model.

MR. ALBRITTON: It is too complex.

MR. SAMET: Yes.

MR. ALBRITTON: And there are too many dimensions to that.

MR. SAMET: There are too many dimensions, and that is probably not the way to go, but I guess going back into my three, then, the question is, are we after number 1 or number 2, or do we know?

MR. ALBRITTON: I believe that, here, we are after...I think we are after your number 1.

MR. KOUTRAKIS: No, no, your number 1 has nothing to do with these numbers.

MR. SAMET: That is right. No, my number 1 study design, not your number 1 but my number 1 which is...my number 1 was the integrative design of an observational study versus my number 2 which was building the population laboratories for future epidemiological studies. So, I think those are the two alternatives.

Number 3 was just going out finding places and making a lot of measurements.

SPEAKER: Yeah, look see. It is a look see.

MR. SAMET: It can be done. So, I think that was...our talking pushed that off the map.

MR. ALBRITTON: Let's bring those questions up as Dan goes through, say, this one in more detail, because this one should be guided by the views that both of you have brought up there.

MR. KOUTRAKIS: Well, let's ask like Jim, because he is here with Ken. I mean, they have a lot of experience. For your number 1, I think the whole thing, it will not take them much time to convince the health and exposure people that this is not the approach to go, but Jim and others, they have been involved and your staff with NARSTO. Can you comment on this? I am sorry, can you comment on this? I mean, I am asking you, do you think that you will be able to ask the question and design a study around that question that is going to take one or two supersites plus the spatial, plus, you know, emission data and try to, in an integrated, comprehensive way, to answer the question as compared to tell you, well, we want to put one site in Philadelphia because we feel like doing that and you try to build a study around it?

I mean, maybe your opinion...we would like to know the number 2 people here, what is your feeling about this problem? Sorry to put you on the spot, but you are probably the person to ask.

MR. VICKERY: I read that inherent in this outline that is prepared in the white paper is the very approach that John Samet just described which is the let's look at the hypotheses that get back to Joe Mauderly's point of the associations we had between that and the health endpoints. We need to test that question of what can we examine that will be able to further enlighten what is

the specific constituent or co-pollutant or other issue that somehow causes this finding of ours.

So, we design the test. We design the hypotheses, the questions, and they will be questions of health, toxicology, population, co-pollutant, meteorology, all these things. So, out of that will fall some set of measurables, and those measurables can be addressed through some combination...I think is what we are after here...of supersite speciation sites, mass-based, broad-based networks over some period of time.

And we ought to design that first and then see what part of that is best answered by a supersite-like structure of five or seven sites at some locations. But I think it is meant to be a much broader approach in your design here.

MR. KOUTRAKIS: First, I will give you an example. In the summer...and I will shut up for those already I spoke to...but I would make...in the summer, for instance, you might decide that you need five supersites- north..., Northeast, who are part of the study, instead of having one here. So, that is...I wanted this design, because of its ability to do the health studies and a source-receptor modeling studies. Are we putting ourselves in a bind here that we don't have flexibility enough to ask process questions?

MR. VICKERY: Well, I think you would have ultimate flexibility in the...

MR. ALBRITTON: Yeah, I think so. Let me also, before passing it back to Dan, let me comment. Perhaps as we look at the next objective here, at least I am aware of initial thinking of exactly what you described from a southeastern U.S. perspective involving Nashville, involving Atlanta, involving a site in that region

that could be called, quote, an initial supersite, an epidemiological study in the same area. It is an infant package of what you just described, and it may well be that as we go through objective 1 here, maybe Jim Meagher or others involved in thinking about that can elucidate this package concept that I think you described, and that is ranging from the...from airborne measurements, what are the hypotheses being tested, how does it tie into the epidemiological study that is, say, occurring in the Atlanta area. That is an appealing little package to me, and I am sure there are other examples that others have in mind there, too.

MR. GREENBAUM: I actually don't think there...we may get caught up in terminology here, but I don't think there is that much difference in what we are trying to do or suggest. I am not...all of you, obviously, should have received if you didn't electronically, and if you didn't get it electronically, it probably is in the back, the concept paper that laid out a first cut at these four objectives, and in that language, there are...we are going to go through each of those now and try and talk about them.

I think it is a little tricky, because there is this assumption built in here that we are going to have five to seven supersites, and that is what we are going to be focusing on, and what I was hearing there is that we should be thinking about this more broad-based discussion on how we design a series of types of studies, hypothesis-driven studies, that can get us better information. And falling out of those designs should be these types of sites and how we make use of supersites and how we make use of other things as well.

I am going to put up on a chart what is in that document,

and if you don't have copies, as I said, there are copies on the table, but I am going to suggest, actually, that we...I am going to go through them quickly.

These are the science questions that were listed in the document. I think what we are going to find...I am going to suggest we go through this fairly quickly and go to the fourth rather than first. But, basically, what was in there is a series of questions, and I am taking in here the...Jon's comment that somewhat this title, health relevant exposure is not quite accurate, because, in fact, what we are really talking about in any sort of sites is monitoring sort of an indicator of exposure or, really, a concentration indicator of one sort or another or a series of concentration indicators.

We had said beforehand that this enterprise was not, in and of itself, going to deal with the issues of the relationship of those indicators to personal exposure, but the questions that are in the document that you should have received and what we want to do here today is try and go through these and see if they need to be turned around, moved around, changed in some ways.

This is the set of science questions. There is also the question of, coming out of this, what is to be measured, who is to measure it, where to do measurements, for what period of time. A series of questions. Things that we have already been talking about here.

The chemical composition, the physical characteristics of fine and coarse aerosols, time variation of those and how well do these measurements represent population exposures, particle concentration and composition variation in space, the spatial variation question which we have talked about, which obviously,

these are not all the questions, by any means, that the supersites are going to answer by themselves.

And there is a fourth which I think is important, in some ways, to this last discussion, and it maybe needs to be phrased in a slightly different way than it is phrased here, the key parameters that need to be measured in order to differentiate among the various hypotheses. I think what we really need to do is turn that around a little bit and ask from a health point of view and also, I suspect, from the...well, in this case, from the health point of view, what are the hypotheses that we feel merit being tested and what kinds of information or data, what kinds of designs are we going to need to try and test those and, falling out of that, what kinds of data.

I am not sure that Jon's two options are necessarily incompatible. We may end up at the same place. I think in neither of them do you end up with the assumption that we are just going to put a bunch of monitors out there and measure a lot of stuff, but, rather, what you are going to end up with is a set of studies designed that need certain types of data in order to test certain hypotheses.

The concept here was that some of that data might come from sites in which we are concentrating our efforts on more sophisticated ability to monitor what is in the air, but some of that data would also come from the rest of the site network. So, given that, let me stop here and just ask the question.

These are the science questions. There are also lots of questions about how we do this, where we do it, what we are trying to do, but let me stop and just say, what are people's reactions to this? Are there things that are missing here? Am I right in saying that somehow this fourth one should be redesigned and re-thought about

and maybe made the first one in the question making...how do people react to this?

The concept here is to take a revised document, and we will ask people to make comments into the starting point of the session that we have in July. Reactions?

MR. ANLAUF: I would agree that the hypotheses, to me, might be a little...it should come first, because when I read through these four science-type questions, I keep asking, well, why are we doing this and why are we doing that. What is the point?

It is interesting, but with regard to health, what is the relationship? Why is it important to do? So, the hypothesis should always be up front, and from that, you have your different questions.

MR. GREENBAUM: Okay, yes?

MS. HERING: I would like to hear from people who have done the health studies what they think might be likely culprits. I would like to hear...because I really don't know, but is it the metal particles? Is it metal particles below a 0.1 um? Is it just non-soluble fine particles? Is it the time variation that...you know, within the day? I mean, these are...

MR. GREENBAUM: Joe Mauderly had the answer to those questions.

MR. MAUDERLY: Oh, yeah, I just thought I would answer it and get us out of here early. No, I mean the problem is that we can't answer that very well, and that is why I raised the issue I did before. I think you have to start at first principles and develop those hypotheses, and you raised a good one.

Because the way I would frame it is not what do we know

toxicologically about different toxicants, because we know a lot. We know metals can be toxic. I mean, we can propose that all these effects are due to metals, and we can, you know, we can do wonderful things with the metals. Sure enough, they are toxic. And so will organics be. And so will other things be. You can poison cells with acids, and you can do these wonderful things.

But you have to start back, I think, since we get mired down in this morass of knowledge just like we can with the knowledge of what can we measure in the air, I think you have to start by saying, look, what do we know. And, really, all we know is that health outcomes are associated with the measurements we have made in a way that convinces us that something is wrong and we have to do something about it, and it results in meetings like this.

So, what is it that can be associated with those measurements that produce this fury that might be causative? You mentioned one, organics. Well, if the hypothesis is that despite these diverse sites where these health effects information come from that one of the constants that varies with particle mass is organics, then you have an organic hypothesis, not because, you know, Costa or Mauderly or Schlesinger or somebody published a paper in 1902 that said organics can poison cells, but because that fits what we know, and it is worth looking at, and it also has some toxicological and medical foundation.

So, that is what I was urging, to kind of turn the question around and start there. You posed organics. You can also pose other things. Then, the question would become, can we pick sites where there are markedly different organic contents in the particles and test that, or can we not? And maybe we can't.

So, all I guess I was trying to get at was sort of a mind set to start developing the hypothesis, because if you want to talk magic bullets, everybody has got their pet magic bullet, and they can demonstrate it. And there is no end to it, and they are everywhere, you know. So, does that make any sense to you, what I am saying?

MR. GREENBAUM: Yes. Yes, and it is part of the challenge. Some of you know that Bill Farland and I received a letter several months ago asking if the health community could name the three or five things that needed to be measured and then would get to measure it, and that is a legitimate question to ask. It is not dissimilar from what you were just asking, but it is also, as Joe has, I think, well stated, not a simple one to answer.

MR. DEMERJIAN: Maybe it would be better to ask a different question. If we gave you the quality information in the next two years from now, speciated information, what will you do with that data?

MR. MAUDERLY: Well, that is a fair question, if you were looking at me. If what you would do is set up a system where you would measure a thousand things instead of three, just to hypothesize, and then you feed that to the health research community, we would all scramble around, you know, trying to write grants on those thousand things. But, again, I am not sure that that is what we want to do, you know.

I think we can tell you, and it has been reiterated this morning, there are a half-dozen or so kinds of constituents of particles that we are concerned about and we are working on, and we don't know which ones might be most important, but we can give you that list of a small number. But in selecting the sites, one would

select the sites, then...one would sort of have to develop a hierarchy of those hypotheses and then try to develop sites that would allow you to test it, not just measure it everywhere or in great detail, but test the hypothesis, and that is going to be very difficult.

MR. DEMERJIAN: That corresponding six or dozen or so compounds that you have on your hit list, are those things that you are looking at clinically, you are looking at in the laboratory, you are looking at...how are you developing more...

MR. MAUDERLY: They are being looked at in many ways.

MR. GREENBAUM: Many of them have been looked at in other settings before, but they are coming back, as Joe said, and being looked at in a more refined fashion specific to this in both laboratory animals and human...beginning to be in human studies and in epidemiology in sort of more targeted epidemiology, not these larger time series studies but more targeted panel studies or something like that.

Jon?

MR. SAMET: Three points. Back to Susanne for a minute and Joe, I actually think that those five or six hypotheses should get listed explicitly in the document...

SPEAKER: Yes.

MR. SAMET: ...and say what the health community actually thinks the hypotheses are so we don't all keep guessing and say, well, we have ten hypotheses now. I think they should actually be listed with some specificity, because we do have best guesses. We have to start with those, and that is whether that is doing epi or tox.

SPEAKER: Right.

MR. SAMET: So, those should get listed out. So, that is the first point. We really should do that.

Second is I know that people who measure can measure a lot of things, but I am sure there is a lot of redundant information in those in terms of both human exposure patterns and then source signatures or characteristics. So, while you can probably measure a lot of things and it might be useful to do that for a while in a few spots, probably, after a while, you can say, well, really, there are redundant patterns here. We really only need to measure X, Y, or Z.

Then, the third point really is that one reason to think about not only the biologic hypotheses we might advance but what can tell us about sources in relationship to those characteristics in terms of thinking about using the information some day for controls. So, that, I think, overlay, that piece about the source should get overlaid on what we measure or health characteristics so that in terms of health effects, ultimately, we can link that. So, I think we should keep that in mind.

MR. GREENBAUM: Howard has been trying to...

MR. FELDMAN: I had a question...maybe you want to go back to it...really, on number 3 here which is talking about the spatial extent, and I guess, to a certain extent, we may want to think about...I feel like it may be our responsibility to think about how many monitors you need of what type. We have heard about the 250 monitors, we have heard about the 50 monitors, and now we are talking about the 5 monitors.

And to me, the question is now we are talking about

where to put them, and maybe there is an underlying justification you need for are five monitors enough. What do you lose? You know, why five? I mean, besides money. But is there some rationale that five is...we heard before Petros mention maybe you want to do special study areas and maybe you want five monitors in one region, and now, how does that relate to other things?

So, to me, it seems like a very important thing is, can we characterize space with just five monitors?

MR. NEAS: I know that I don't have a location, but I thought by monitoring location to these sites you meant more than a single monitoring location, something more like Petros' five urban areas study where you went into an urban area and, you know, threw sites around that urban area that you could categorize the entire urban area. I thought we were going about these supersites in that vein.

MR. GREENBAUM: A rather particular...

MR. NEAS: I am talking about one...on top of one building, there will be one...

SPEAKER: Has that been explained?

MR. NEAS: Oh, well, I don't...

SPEAKER: I don't think that has been decided yet.

MS. HERING: I think that is not decided.

MR. GREENBAUM: Everybody can come up with ideas on what they think a supersite is. I don't think that is so clear. It may well be that one concept here is of a site where you have got a very high level of resolution, of detail, with the assumption being that you are going to be doing a whole series of

special studies around that site at other locations in a region to get at some of these questions of population distribution, population exposures, the influence of geographic detail on dispersion of the pollutants across a metropolitan area.

I don't think we...the simple concept of we are going to have one platform, and it is going to collect all the data that is useful to us, I don't think anybody in this room would accept that that is likely to be the case in any location. On the other hand, a very sophisticated site may be at the core of a larger effort to try and get at that.

Jim, did you want to say something?

MR. MEAGHER: The policy makers, one of the things we are talking about in the policy review is basically trying to bound the problem in some way, and maybe we can ask the question a little differently, and that is, are there things we can eliminate and things that we don't have to monitor and know about that would allow us to refine the emission set in some useful way.

MR. GREENBAUM: And that is a good question. I would be interested to hear what people from the health community would say. I think one of the challenges we have right now is that there are enough hypotheses and enough ideas out there that sort of suggest there are some things that we can say for sure is important.

MR. MEAGHER: Or even with a high probability, we don't think they are unlikely.

MR. GREENBAUM: Right. I suspect, in the iteration process, we will be able to do that. I am not sure that, early on, we will be.

MR. SCHLESINGER: Dan, did you say there are things we can say for sure aren't doing it or are doing it?

MR. GREENBAUM: Aren't, are not.

MR. SCHLESINGER: Are not. Like what?

MR. GREENBAUM: No, I am saying I didn't think there were. I am sorry. There were too many...

MR. SCHLESINGER: It is dangerous to eliminate anything now, because...

MR. GREENBAUM: That is exactly right. I was prompting you to say that.

MR. SCHLESINGER: The ultrafine is where the thing of...and now, maybe not. Maybe the coarse was not doing anything, and now there are some studies suggesting that it is. So, I don't think you can eliminate anything right now.

MR. GREENBAUM: Right.

MR. SCHLESINGER: Is that the answer you wanted?

MR. GREENBAUM: Well, Jim was sort of hoping that that wasn't the answer you would get, but I suspect that...I also think there is a danger at this stage, because it is such a formative stage on the health side, of prematurely going down a path and saying this is the answer and missing the real...

MR. SCHLESINGER: I have a question. As a lowly health person amongst all these monitoring people, I am getting slightly confused about the purpose of what we are doing here.

MR. GREENBAUM: We can have competitions for who feels more lowly or less lowly.

MR. SCHLESINGER: Well, right here, it is us. In the next building, it will be them, but anyway, it seems...what I initially thought was that the purpose of the discussion was to, at least on the health part, to try to, I guess, guide the development of these research monitoring sites to answer these questions, those five to seven sites. Is that correct?

MR. GREENBAUM: Yes.

MR. SCHLESINGER: But in Petros' overview of speciation network, he mentioned that they would like to use those data also to support health effects studies. So, what is...

MR. KOUTRAKIS: It's going to be very powerful, by the way. The speciation can be even more powerful.

MR. SCHLESINGER: Right, so I don't understand what the difference why there are...I can see the implementation sites or the compliance monitoring sites which would just be looking at specific things, but I am having a problem trying to see what the difference is between the speciation network and this network and why there is a difference and why can't speciation network be used to answer all these questions in more sites.

MR. GREENBAUM: Well, let me ask a practical question, then. The speciation network, as I heard what Petros put up there, isn't going to give you an awful lot about metals concentrations, for example.

MR. KOUTRAKIS: No, it is going to give you metals and carbon and organic carbon, inorganic carbon, soil, ions, everything.

MR. GREENBAUM: But specific metals?

MR. KOUTRAKIS: Everything. Let me ask

the question. Are you prepared to get 50 sites in the composition, or do you want to get every 5 minutes for 5 sites?

MR. SAMET: It depends on the health data. I mean, so if we are looking at long-term mortality, we probably want morph sizing for how to characterize long-term exposure. If we are worried about responses of asthmatics, we may want more time resolved.

MR. SAXENA: You have two paradigms. One is where Jon is right about. You can only maybe use five or ten parameters for regressions in epi studies. It is 24-hour time resolution and what is being done at speciation monitors, I think, is more than what probably an epi can use. Is that adequate for PM sites?

If you want to go into this kind of a figure, which I welcome, and it is then more overlap with the atmospheric process community, but then, are you prepared to handle the amount of information that will come out of this study, trace metals at two-minute resolution? It is a lot of information. How is the health community going to do that?

So, in fact, I guess I am asking the same question that Rick asked, will the information from the speciation monitoring network be sufficient? If not, then, you know, I think this is a good thing to do. We are going in the right direction, but we should be thinking about how you execute it.

MR. SCHLESINGER: How fixed is the speciation network? Everything seems to be fixed. How fixed is the speciation network in terms of the six day or one day?

MR. ALBRITTON: You are here to guide us

on that. That is basically what is going to...we are open.

MR. SCHLESINGER: Because it seems to me...I may be getting off, but it seems to me that to try to pick 5 sites is sort of a nightmare when you have 300 sites on the other one, and maybe some combination of the research monitoring speciation sites would be better in more places than just guessing at where to put these 5 sites to answer Dan's question of what should we measure.

And even when Joe, trying to find a site that is high organic type, that is low organic, a site that is high organic with no ozone or low in organics with ozone, well, we would never be able to do this. That is where my confusion is in this whole thing. One thing is how fixed...you answered it, I guess, how fixed are these three tiers of monitoring relationships in looking at this question.

MR. GREENBAUM: One thing that directed us here in bringing the health community into this discussion is that until this set of speciation monitors and ideas came forward, what the community has had available to it in terms of monitoring data to plug into epidemiologic studies has been the air admittedly, and has scrambled periodically to try and find sulfate data or to find some other pieces but has not had any, you know, systematic collection of data other than PM_{10}, ozone, et cetera that was readily adaptable, for example, to a time series analysis.

I think, in part, one of the questions that is here is that the surfeit of data...and this is what Pradeep was saying...that will show up with these speciation sites is almost too much in some ways but, in some ways, may serve a lot of...I mean, it will already bring the health epidemiology another step forward in being able to do some things that haven't been able to be done, presuming there is

enough data in that city and enough time resolutions to try and do that.

But it is an interesting challenge, because then the supersites, I think there is this technical question which those in the health community may be less familiar with is what you do above and beyond that at the supersite that is going to be particularly helpful to you that you don't already get from this.

MR. CASS: I think that one of the problems we have here, there are so many degrees of freedom within each one of these four points that we are going to be discussing that if we don't decide to get really specific and focus relatively quickly, we are going to be having very general discussions all the way into July, and nothing will get decided.

Some of the things that I can see poking up above the crowd from the discussion we have had so far is I think we could probably achieve consensus on the notion that we should be designing studies and not setting out sites. In other words, we ought to be designing research and not just putting out hardware.

Then, the next thing is that, what kind of research? Well, we want to be able to conduct some health effects-related studies using these assets, and we want to be able to undertake source apportionment modeling, emission control planning, and tracking of whole programs.

And if we then go back to the health effects side of things and say, fine, you know, what are the most probable candidate hypotheses that bear on differences in pollutant physical characteristics and chemical composition that somebody, at least, would like to test within one of these studies that could be organized

before the sites are set out? If we could get a half a dozen of those hypotheses...it may not be all of the hypotheses, but at least there would be some...down on the board, then the people who are familiar with measurement techniques could say yes, this is the kind of hardware that would be suited to testing those...gathering the data that can be used in a data analysis to test those hypotheses.

Now, my belief is that when you start designing studies instead of setting out hardware, you would find that your studies will end up being organized around a collection of monitoring sites, not one site. The collection of sites might include a supersite and four or five of the speciation monitors and one or two background sites. In other words, your study would probably involve information at several different levels feeding into the analysis.

Likewise, if we said based on our experience with setting out studies to understand source control questions, what kind of studies are these? We have had quite a lot of experience with that. Things like the Southern California Air Quality study which essentially was a platform for gathering data to be used in model evaluation studies looks an awful lot like one or two of your supersites and five to ten of your speciation monitors and a couple of your background sites.

Oh, okay, well, that package works. What is different about your current situation than the kinds of field studies that have been conducted in the past? Well, it turns out that you are going to be having an air quality standard where you are going to be in most locations binding on the annual average, an annual average air quality standard.

And in the past, most of the field studies of the kind that I

just described using that collection of hardware have been aimed at testing or providing data to be used in testing episodic models. So, now, driven by a standard that is going to bind on the annual average, we may wish to be setting out a package of hardware used for gathering data that can be used to test models that are supposed to be useful in a process driven by compliance with an annual average air quality standard.

Now, you can get your teeth into figuring out what kind of hardware that is. Okay? Once you know what kind of models you want to test. And some of those models these days involve issues relating to particle size, size distributions, the size distribution of the chemical processes, single particle characteristics, ultrafine particle number and concentration and chemical composition.

Well, son-of-a-gun, these are also the same issues that would affect determination of parameters important to the various health hypotheses as well. Now, is it possible to identify a set of hardware at these sites or at these pods of sites in a region that meet simultaneously the requirements of the most probably important health study and, simultaneously, the most probably important study for testing air quality modeling and control purposes?

I think you will find that the equipment can be made to coincide. Finally, after that...

MR. GREENBAUM: You have stated this very nicely, and I understand part of what I think we didn't focus on was, when Dan put these, the four objectives up there is what we are really talking about is an optimization process in which you are trying to say sort of what is the health driven needs here, what are the source-receptor modeling and the management-related needs, what

are the...and then, how do you integrate them? And I think you are right. There are some opportunities for us to look at.

MR. CASS: One thing, in addition, that is part of this optimization process is a cost restraint, because we could be talking all over the map on hardware, of sites, of places, but we can focus a lot more logically on this problem if we have some ball park cost target that we have to stay under as a practical matter, you know, because then that will focus your attention on where you have got to, you know, make things squeeze and fit.

MR. GREENBAUM: All right, but before we...I agree with that as part of what we are trying to do here. I think before we jump to that level, I think what we are trying to do here is understand how we take a set of steps, much in the way that you suggested, and then bring ourselves to a place where, in the July meeting, we can further play out that.

I very much like the idea you had of spelling out the hypotheses, thinking about how those work, and then bringing them to a setting where there can be exactly the interchange we are looking for between the people who understand those hypotheses and where they are coming from and the people who know what you can or can't measure and what is useful and not and starting to think about that from the framework of study design, not from the framework of site design, and I think that is essential.

MR. CASS: I am suggesting, Dan, that the sooner we do that, the better off we are going to be. If we allow that discussion to proceed at a very general level throughout the entire day today without getting down to brass tacks, it is going to be even harder to get down to brass tacks in the larger meeting in July.

MR. GREENBAUM: Well, the question there is how quickly, I mean, the health community could actually play out for us the four or five hypotheses that best...

MS. HERING: That was the point of my initial question.

MR. GREENBAUM: You have got to articulate how we do that. I don't think...

MS. HERING: Jonathan, what are the fine points?

MR. SAMET: You want my opinion?

MS. HERING: Yes, I really would like to know. I don't know.

SPEAKER: Well, there are really eight.

MR. GREENBAUM: There are really eight?

SPEAKER: Well, that could be both, though, and that should be on the table by July.

MR. GREENBAUM: The other question is whether...what?

SPEAKER: We can go around on this and talk about particles all afternoon, but if we have...

MR. MAUDERLY: Well, but the hesitance is, of course, is that we might leave out one or we might not include...

SPEAKER: Who cares?

MR. MAUDERLY: But it is very straightforward. The one we know most about is mass.

SPEAKER: Write number 1 down there. Number 1 is mass.

MR. MAUDERLY: We argue about coarse

versus fine, and the epidemiologists have given us mass, because the toxicologists didn't predict that that little mass would do anything. The next, I would say, strongest evidence we have is metals, and these aren't in rank order.

SPEAKER: Don't worry. Just keep going.

MR. MAUDERLY: But I think that we have a lot of evidence because of linkages between epi and tox in certain places that metals, at least in some cases, are probably important. Then we have what I would call the masses of hypotheses that are all sort of equally supportive of...

MR. GREENBAUM: Before we go beyond that, though, are there any metals that rise above others? I know of some, but I am curious if...

SPEAKER: Well, it seems to be primarily the transition metals.

MR. GREENBAUM: Okay.

SPEAKER: And there seems to be an issue associated with the viability of the stuff.

SPEAKER: And that is a key question, because we heard earlier they are doing metals, but they are going to be doing bulk, just total bulk composition, on oxidation state or bioavailability.

SPEAKER: Net bioavailability, so we have some...

MR. MAUDERLY: I am going to give you eight.

MR. GREENBAUM: All right. That is all right.

MR. MAUDERLY: Okay? And, again, these aren't in rank order. People have forever been talking about acid or hydrogen ion. That is not a dead hypothesis.

People are talking about organics, and we are not usually talking about long-chain alophatics. We are talking about clever chicken-wire organics in most cases.

People talk about ultrafines. The epi didn't give us that signal, but we are speculating about it, and some work that is being done more recently is suggesting that that could be the case.

We are...we, the broad science and medical community, is talking about biologicals, you know, the interaction between materials of biological origin either as airborne materials or collisions on particle or whatever to get at allergic reactions.

We have salts, sulfate, nitrate, kinds of salts that people are talking about.

And what did I leave out? I had eight of them. No, I had seven of them. Now, we can add others, but that is sort of the spectrum of things people are talking about.

MR. LIOY: You have got to have something about synergy between mass and ozone and...

MR. KOUTRAKIS: Co-pollutants.

MR. MAUDERLY: Now, I have got a question. Off the top of the head, what are the hunches of a few key co-polluters?

MR. NEAS: Ozone.

SPEAKER: Ozone.

SPEAKER: Right.

MR. MAUDERLY: Well, our hunches are just

based on sort of what we have been interested in and been looking at. I think, objectively, there may be some surprises, but, certainly, ozone is right up there as a key player.

MR. NEAS: I thought Petros said not to try to prophesy.

MR. COSTA: I wouldn't throw all of my weight towards gaseous co-pollutants, because we know, from some data, the actual composition of the particles may affect the bioavailability of, for example, metals with that association. Acids, for example, will release metals which will bring the particles together. Acids alone, at least in some experimental systems, doesn't show a whole lot, but when you put those together, it does.

So, the co-pollutants are not just gaseous things floating at the same time.

MR. MAUDERLY: But the measurement people want some key places to start, and that is kind of the laundry list, and then we quickly get into things exactly like Dan was pointing out, the what if things and the interactions which, you know, are myriad, but these are the things that people have talked the most about in the last couple of years.

MR. COSTA: There is one other that comes up periodically, and there really isn't a whole lot of, actually, research to show one way or the other, is that this long line of oxidants or peroxides that associate, and...

SPEAKER: Peroxide.

MR. COSTA: But, you know, when you put...macrophages generate tons more peroxide than any particle could ever dilute. So, you could argue that...

MR. NEAS: On the number 3, I thought of categorizing that myself as a model where the toxicity is the delivered dose of some toxic agent that is consumed by the process of delivery in the studies. So, hydrogen ion and hydrogen peroxide would fall together in that, along with anything else that is consumed by the process of...and that has really fallen out of favor, because there just isn't enough delivered dose.

The metals is in favor, because you deliver something that can involve itself in a catalytic reaction, so it is not consumed by the process of delivering its toxic effect. But 3 is sort of a delivered dose toxic agent.

MR. SCHLESINGER: You are saying that there is not enough delivered acid to justify its measurement as contributing towards PM? Is that what you are saying?

MR. NEAS: Based on...

SPEAKER: Some of the preliminary research we have done in the urban areas where there is very low acidity and in certain of the mortality studies in the areas where there is low acidity like Utah Valley, it isn't as popular as it once was.

MR. NEAS: Right, but it may benefit another area, and get us to the problem of siting. There are studies which show acidity is related to morbidity in the eastern part of the country, and we know that acidity, you can deliver enough dose off experimental systems to do something even not too far above reality.

MR. MAUDERLY: But I think you two fellows have just demonstrated the point, and that is that the biologists will argue for their favored or less favored hypotheses, but you would probably all agree that that is sort of the list of things people are

arguing about.

SPEAKER: That is right.

SPEAKER: Yes.

SPEAKER: So, the point is that most of the things on that list can be measured at some level.

MS. HERING: Yes.

SPEAKER: And there are a couple of them that are a little harder than others, but if we focus on that list, we can make some progress.

MR. GREENBAUM: Right.

MR. FELDMAN: I was just going to go back to if there were some...we are talking about rationales and things that should be in here, and if there is a rationale for why we have this 250 and then 50 and then 5, if we can be explicit about that, if we can be explicit about this, if we can be explicit about how that was arrived at and why we are thinking about it that way either now or in advance of July, I think that is going to be very helpful.

MR. GREENBAUM: And there may be...part of the rationale for that came out of a whole set of decisions and discussions that went on within EPA in terms of the 250 and the 50 and the other pieces which are in documents which we have all received. Whether we need more detail than that is a good question.

Petros?

MR. KOUTRAKIS: Can you include the organics, the elemental and organic carbon, because there is some studies that find, you know, soot to be a, you know...so, we have to...organics, it is elemental and organic carbon. Just parentheses, elemental organic carbon.

MR. GREENBAUM: Yeah.

MR. MAUDERLY: I am not sure. If we list elemental carbon, then let's list ports. I mean, it is just...it is part of the particulate.

MR. KOUTRAKIS: Elemental, elemental carbon.

MR. MAUDERLY: But the thing that the biologists are arguing about are the organic fraction.

SPEAKER: Yes.

MR. MAUDERLY: You would want to know the elemental carbon. It is part of the fine, sometimes part of the ultrafine, but I don't know a biologist personally, I guess, that has been arguing strongly that elemental carbon is likely to be a causal finding.

MR. KOUTRAKIS: But when you go out and do organic carbon, you have got to get both of them, so I think it is an important thing to...

SPEAKER: Yeah, we are moving over into what the hypothesis is versus what you can measure, which is important, but...

MR. KOUTRAKIS: Maybe for health effects people, there is a difference or...

MR. GREENBAUM: Right.

MR. KOUTRAKIS: Or maybe the people in organics...

MR. MAUDERLY: There is a separate list for source apportionment, too, which would certainly include elemental carbon.

MR. LIOY: But organics beyond elemental carbon, organic carbon, now you have different fractions. You have the highly oxidized fractions and the, you know, the PAHs. So, you have got to stop somewhere, or you have got to start somewhere. What is the most important part of the organic fraction we need to measure? Do you measure just total organics, or is that just as bad as measuring mass?

MR. KOUTRAKIS: When you say organics, people in my business, they think about organic compounds and not the total carbon or elemental carbon.

MR. MAUDERLY: Well, that is the way we think, too. We don't call elemental carbon organics.

MR. KOUTRAKIS: So, in that case, I am listing as number 9 or number 10 elemental carbon. We find very...I won't go into details, but I think elemental carbon should be...

MR. GREENBAUM: Well, isn't elemental carbon a subset of ultrafine?

MR. KOUTRAKIS: Yes, well, that is...

SPEAKER: No.

MS. HERING: No.

MR. GREENBAUM: It doesn't have to be, I know, but...

MR. KOUTRAKIS: Whether we specify it or include it in...

SPEAKER: Why don't we put organics and then, number 10, we put soot?

MR. KOUTRAKIS: Or elemental carbon.

MR. MAUDERLY: You are going to have to

come up with a separate list of compounds you want for source apportionment or even for the statement earlier you want closure on total mass.

MR. GREENBAUM: That is right.

MR. MAUDERLY: And elemental carbon would be on both of those.

SPEAKER: So, you don't have to put it on the health effects list?

MR. COSTA: Well, I don't know of any way...

MR. MAUDERLY: No, I have never heard anybody...

MR. COSTA: I mean, anyone who is in organics has sense enough to look at elemental carbon...

MR. MAUDERLY: It may prove to be the main controller.

MR. GREENBAUM: Nobody is suggesting that elemental carbon, in and of itself, is driving the health effects, although it is one the things that you are going to be measuring, and you are going to need to be doing it for source apportionment.

MR. KOUTRAKIS: People in Europe have done...

MR. GREENBAUM: Excuse me?

MR. KOUTRAKIS: People in Europe have done a lot of studies and HEI has done a lot of studies which shows...

MR. GREENBAUM: Right, but they are using elemental carbon as part of a source apportionment effort to try and understand that as a marker for diesel exhaust.

MR. KOUTRAKIS: Well, the best predictor

we have for health effects for the job and risk studies is elemental carbon right now. That comes out as the strongest effects. I don't want to talk health effects, but it is a very important idea.

MS. HERING: One thing that strikes me that is not on this list is size distributions. Do we care about details...

MR. MAUDERLY: Oh, yes, it is. When we talk about mass, we talk about coarse versus fine and ultrafine.

MS. HERING: Do you care about the details of the size...I mean, the accumulation mode is often now, you know, it's described as two modes, a condensation mode and a droplet mode. I mean, there is...does it matter if your sulfates are in 0.2 um particles or 0.7 um particles? And they can be found in either size in different places in the country. Or the organics or...

MR. MAUDERLY: It might matter, but we don't know that. All we are trying to portray is the sort of key things...

MS. HERING: And it is not on that list.

MR. MAUDERLY: ...that the health community is talking about. Now, within each of those, they overlay. That is a good example. If a compound of sulfate or whatever is important, then, does the particle size range that it occurs in have an effect? Yeah, it probably does. Who knows?

MR. LIOY: But what are you going to control? You can still control SO_2. It doesn't matter. It just doesn't matter whether it is ultra-ultra or in between in terms of the eventual need to control when you have to control the SO_2.

MR. KOUTRAKIS: You change the, you change the composition when you bring...

MR. LIOY: Yeah. I mean, you can have hydrogen, you can have hydroscopic growth in the lung and...

MR. GREENBAUM: Well, it could matter in terms of what control strategies get implemented in different technologies, because, in fact, we...because we have seen control strategies for mass, for example, result in changes in size distribution, and it may be that that has to be a design parameter and in what...

MR. LIOY: Most of the SO_2 is not coming out...most of the sulfate is not coming out in...

MR. GREENBAUM: I was talking about diesel, for example, where we are seeing, in some studies, the 80 percent reduction in mass resulted in a 40 percent in...

MR. LIOY: Right, you take out primary particles, yeah. There is a difference between primary and secondary, and we can get lost in...

MR. GREENBAUM: But you are getting to a level...I would agree that you are getting to a level of refinement of our understanding that is way beyond what we can say.

MR. ALBRITTON: This is an excellent list of items that, again, as Glen said, gets us focusing down to some things that we suggest be done about specific compounds. I have a related question, returning to a higher level there, and that is, from a health perspective, what is your guidance on the time interval that we measure?

In other words, what kind of data...you said that the earlier studies were based on mass and then health endpoints. What were the time intervals over that that the mass was taken over, and

how would you like it to be done differently if you wanted a sharper data set? Is annual? Is seasonal? Are seasonal differences...

SPEAKER: That is a different...

MR. GREENBAUM: Yeah, I was just going to say that, but we'll let Jon think about it.

MR. NEAS: I'll take the first shot at it, and then Jon. We have been talking about times series as if that were all of epidemiology, the sort of Philadelphia study paradigm, but there are other paradigms for epidemiology.

One is the short-term sort of summer camp study is the best paradigm for this where you go into an area and conduct repeated physiological measurements on the same subjects. So, each subject serves as its own control, and in a period of a month, you are in and out with enough data for a study.

Heat flow has been used for a number of these. Cardiac endpoints are now the hot item, but they are all of the same sort, and they are all performed in about four to six weeks, and you get quite a bit of information in that amount of time.

But both of these rely on gradients over time, and to the extent that all five components of particle mass, all of these, are correlated, you know, you give me two years' worth of information, but they are all correlated at the 0.96 level, you haven't told me anything. I have no exposure gradient over which to do my study.

If we are talking about gradients over space, then we are talking about the Six Cities model, but we have to go in and collect lots of information on potential confounders. You have to well characterize the individuals under study, because there are many different reasons for a particular area to have a higher rate of health

effects than another one.

Those studies tend to be relatively expensive and are best done in close collaboration with the monitoring team. I think those are planned only in the very long term.

So, let us keep in mind there is more than one way to conduct epidemiologic studies.

MR. GREENBAUM: I think that is a good point. I also think it is fair to say that time series...I mean, most people would argue that time series of the sorts we have done to date are not terribly useful to continue to do in some ways, just because they are sort of very...they are rough cuts, but on the other hand, there have not been available, you know, detailed data in any city on anything other than these very gross measurements of mass, for example.

And, conceivably...I mean, we have a study that is beginning to look at...in Germany that is beginning to do a time series where you have particle number data and you also have speciation data. So, you could begin to see whether you get a higher association with one or another component of that.

But, Jon, I don't know, do you want to comment on this, this issue?

MR. SAMET: You know, I think the time resolution really depends on what we think are the dynamics of the underlying process of toxicity, and I think we have to think through endpoints and the list, and there are some where we would be interested in shorter-term indicators, say, asthma and responses for perhaps some of the cardiac responses and then, I think concern over the long run for factors that might determine long-range

mortality.

I think if these sites are set up and the studies are set up at the sites, they should be considered as long run. I guess the thing I would argue is sort of...this is on the health design side. I was thinking about a set of public health-relevant indicators, and I think part of our struggle with some of the information that comes out of some of the studies is public health translation.

So, I think no matter what, studies should be taking...going the other way, we should be looking at useful public health indicators, mortality, hospitalizations, emergency room visits, and putting those in the context of these hypotheses related to specific agents that, ultimately, we think affect public health. I think that also will influence how we talk about the timing.

But I don't think there is anything that resolves, on a real short-term basis...and, presumably, the dynamics of response are on a time course, and once we get the mechanism, we will probably get a better...a really informed response.

MR. GREENBAUM: Yeah. I mean, I think one of the things that differentiates this debate, this discussion from, for example, the ozone discussion has been the driver that is mortality, the mortality findings, and then sort of questions have been raised about what sorts of things might be leading towards premature mortality, which is a very different set of dynamics than, you know, a drop in lung function in kids from...that is a reversible drop in lung function in kids at a summer camp exposed to ozone.

And it is not...there are...I think you are right with this to point out that there are many different designs that you need to create data for. I think some of those require...I don't think we are

going to get to a level of detail that is going to tell us this is specifically what we need from this kind of site, but I think we might get to some general sense of parameters that allows you to then think about what is the most sensitive type of site or sites to deal with.

Jim wanted to say something.

MR. MEAGHER: I just wanted to make one...that there are two different reasons to look at short-term response measurements, and one of them is that you have a response, a health response which results over time. The other is to create a metric that is appropriate for the analysis you are making. The instruments that we use to do 24-hour averages are averaging for us and creating a metric that may not be useful in terms of what the application is.

If the average represents the data in some useful way, then that is a useful thing to do, but if you have data that is very spiky where the exposure, for example, you know, the 80/20 rule, it occurs 20 percent of the time at 80 percent of the dose, then you may need to create a different metric or distribution that actually represents the exposure in the sense of trying to use an instrument that automatically averages for you.

So, I think you may not be able to see a response that is on a time scale that is every five minutes, but you may have to do that measurement in order to produce a metric that you can actually associate with the endpoint in some way that is useful.

MR. GREENBAUM: Well, you are...

MR. SAMET: Especially if you know. I mean...

MR. GREENBAUM: What?

MR. SAMET: I mean, depending on...it again goes back to the dynamics of dose-response and whether, you know, there are thresholds that may have to, for example, be crossed or whether the cumulative exposure to dose is relevant.

MS. HERING: But I think what you were pointing to is also, you know, the time series of your outdoor concentrations may have some relation to, you know, when people are outside and when they are inside. So, it is...I mean, just a simple day, night sort of thing.

MR. GREENBAUM: Right. The other element, of course, is that there are daily patterns of even response irrespective of health. I mean, if you measure somebody's pulse rate in the morning and you measure it in the evening, if you measure their FED1, their lung function, at different times of the day, you will get differences having nothing to do with air pollution. So, you have to sort of factor some of those in.

On the other hand, we are starting to see so-called panel studies where these sorts of other types of epidemiology designs where you are seeing fairly sophisticated efforts to measure, for example, Holter monitors on somebody over the course of a 24-hour period to measure sort of responses, and the daily pattern of air pollution might be important in interpreting the results of that as opposed to the daily average. So, it gets tricky.

MR. KOUTRAKIS: But you need to coordinate. If you were to do time analysis, you have to do the time...if you were to put Holters on people, you have to get the epidemiology and the measurements at the same time. You talk

about the perspective. So, to take advantage of the time variability, you have to coordinate the camp studies up front.

MR. LIOY: You have to do the camp studies, you're telling me, so that you have the background to coordinate the other.

MR. KOUTRAKIS: Otherwise, you don't take advantage of the time information.

MR. GREENBAUM: Right, but I think one of the concepts that we have to wrestle with here is are we talking about...are we talking about a set of relatively flexible monitoring capabilities that allows one to move in and out of a particular area with these kinds of studies, because you know there is a very high resolution capability for at least a central part of that monitoring.

Obviously, you know, if you are studying a group of people, you are going to have to have indoor measurements at their home. You are going to have to have a whole variety of other pieces of information for that study.

But if you know there is a fairly well population-based set of measurements being done nearby, then that is going to influence your study design. You are going to say gee, I will go into that region, because I know there is something here and there is an opportunity.

MR. ALBRITTON: I think we are speaking of that flexibility.

MR. GREENBAUM: That is right. I think that is right.

MR. KOUTRAKIS: One more thing. I think we keep talking about epidemiology. I think we should talk about

exposure. I mean, if we are studying New York or Boston..., we are finding real time health effects, and that data should be used in toxicological studies. So, not just focus on data to be used for epi but I think also for toxicology.

MR. GREENBAUM: Sure. Well, I think something to put in...I mentioned this at dinner last night with Dan and Jim that may need to be put into the mix here, and I am not quite sure how it plays out, is that we are seeing now a growing number of sites around the country where toxicological studies are being done with one or another form of concentrated ambient particles which are, in themselves, being fairly carefully characterized for what their content is, et cetera.

Number one, that is a source of information in some ways, but it is also how that relates to...how those toxicological studies relate to whatever is being measured in the region.

Did I see a hand go up here?

MR. DEMERJIAN: Well, I just had a question. I think I know what the answer is, but I will ask it anyway. Is there in place in the health effects community the ability to monitor and track, for example, something like asthmatic hospital admissions?

SPEAKER: Sure.

MR. DEMERJIAN: And is that routinely put in place, and can it be routinely used as this network gets put in place so that you can start looking at the effects of changes and potential responses of the system, the effects?

MR. GREENBAUM: Well, this is...objective 3, evaluation of management strategies that we talked about, is an area where I think both the monitoring community and the health

community would love to be able to do this better, i.e., over time, do you see some effect on improving air pollution on reductions in certain types of hospitalizations and those kinds of things?

And I think that is something we will probably get into a little more this afternoon. That challenge is that that data is not always readily available.

We are funding a study in Canada, because in the national health system there, there are...the data base exists to track individuals over a long period of time in great detail which doesn't exist, at least so easily, here.

MR. COOK: I just wanted to jump maybe ahead to some of the general characteristics and principles at the end of the document that came out, and it talked about the assumption that these particles were at room temperature and relative humidity. Are we looking at these with regards to that as the criteria? Or is that something that I have misinterpreted?

MR. GREENBAUM: I am going to let the people who wrote that down respond to that.

MR. CASS: Susanne?

MS. HERING: Well, this is arguably, not knowing really anything about health effects or your...I didn't even know this list of eight things or ten things, but I sort of thought it just kind of made sense to me. People are mostly indoors, and yes, outdoor particles get transported indoors, and the fines are especially efficient in making that route, but once they come indoors, they get re-equilibrated to the temperature, the relative humidity, and the gas states mix that you find in the indoor environment.

So, even though you are talking about outdoor particles,

you are talking about the...in the 80 percent or 90 percent of the time of the day that people spend indoors, you are talking about that when they are at this indoor state, not really when they are at the outdoor state.

So, when we are doing our outdoor measurements, should we take some of this outdoor aerosol and put it at, you know, 40 percent RH and 22 degrees C, you know, something that is typical of an indoor condition and just let the nitrates evaporate or let the nitric acid become nitrate? I mean, is that...it just seems to me something that ought to be addressed.

MR. SCHLESINGER: It seems to me that we are getting a little over complicated at this point.

MR. GREENBAUM: Yeah, we are...I don't know, the health effects community probably would like to say that it was more sophisticated than it is. The level at which we understand any one of these hypotheses is...probably doesn't allow us...a little time to get to that.

MS. HERING: Well, it is just a question.

MR. GREENBAUM: No, I think you raise a good point, and I think it also shows up...is beginning to show up in people starting to ask the question about particle aging and changes in toxicity with different levels of aging in the atmosphere, let alone the indoor issue.

MS. HERING: Yeah, I think from a measurement point of view, it wouldn't be hard to do. Okay? Just put your sampler indoors.

MR. GREENBAUM: Right.

MR. KOUTRAKIS: Going back to Dan's

suggestion, which he said earlier we better spell out, we design research and not sites. Do you want to say something, we design research and not sites, and do you want to comment on that? I mean, what's the prospect of how we incorporate that in this discussion?

MR. GREENBAUM: Well, my sense was that what we first were trying to do is try and tease out these questions of what are the hypotheses, which is research design we are talking about here, the kind of time course you are talking about.

One of the questions I had was the where, the sort of population-related. You know, how do you characterize population exposure versus susceptible population exposures? And start to really come at it from that direction.

I think it will not be simple to say this is the kind of study we want to do epidemiologically, and therefore, this is what we need for data. Because, in fact, at this stage, there are probably dozens of types of studies that we need to do both toxicologically and epidemiologically to get further down this path, and part of the challenge, I think, for this group is to figure out the optimization of what is likely to be the sum of information needed by those studies scientifically.

And this limits it to some extent. I mean, this doesn't say measure the world. It says measure a lot of things, but what is the sum of those things and how does one respond to that in a monitoring system either by do we already have it because of what we have in the speciation network or do we need these more specific sites in certain locations?

I don't think we will get to the place of saying this is the study we need to...the study we need to design, and, therefore, we

should design a monitoring system vis a vis this study, because you can't even do the same design to test these different hypotheses if you were using only epidemiology and, certainly, in toxicology as well.

MR. MEAGHER: I was going to say, not to put words in Glen's mouth, but I think what Glen was saying is exactly right, that we don't do this activity in isolation, that we are looking at what needs to be done in general, and there are other pieces of the puzzle out there, and combining the resources that are available in these other networks and then maybe adding, as an addition to something that would be at a supersite intensive field studies that support and give detailed information and combine those with what is going on in the epidemiological health effects community and things like that.

That is the message I got from sort of Petros's and Glen's comments was that this is not something we are just going to put our blinders on and look at these sites by themselves. We are going to look at the whole thing holistically and then find a place that this fits in and add something significant where we answer questions that the other pieces don't do by themselves. I think that is very important, and it is exactly the spirit of the whole thing.

MR. GREENBAUM: I think that is important.

MR. CASS: The other thing is that by getting this list up on the board, it makes it possible for me, for example, to look at the list and say, you know, an awful lot of these health endpoints could be examined pretty effectively with a slightly souped up speciation monitor.

SPEAKER: Exactly.

MR. CASS: And then, what that says is now, you are not limited to five sites. You can create a cloud of sites around one of your, you know, very detailed analytic website that had most of the attributes of the supersite from the point of view of addressing these particular hypotheses.

So, you are not really talking about five heavily instrumented sites and then you just fall off the edge of the earth. You could have a whole cloud of sites that were nearly as good for this purpose based on those slightly improved speciation monitoring sites.

MR. GREENBAUM: Right, and as I said, if we succeed...if this plan succeeds in coming up with sort of what are at least called routine speciation sites, I mean, the kind of network that Petros was describing as coming out of the EPA plan, the data availability for these kinds of questions, even given the existing technology, is going to be so much further advanced than what it has been that I think that is going to give you something.

But then, what you are saying is that maybe with some refinements, you could even take that another step.

MS. HERING: Actually, what I did is I made a list here of the ten things...all right...what would be measured with the 24-hour average in the speciation sites and then what other things remain, and I had put them under the more intense sites.

For instance, the masses can be measured at speciation sites. What is not measured is the size distribution element. Okay? The metals, you don't have the oxide states in the regular speciation sites. The acids are not in the speciation sites is my understanding.

Organics, this is probably the biggest missing thing in the

speciation sites. Based on the sample size, it is not suitable for doing any kind of chemical speciation of the organic fraction, nor is it probably a suitable sample.

And then you have got nuclei and ultrafines are currently not measured at all in the speciation sites. Biologicals are not measured at all. Sulfates and nitrates are adequately handled. Ozone, co-pollutants, most of those are probably adequately handled. Peroxide is not measured at all. Soot is covered.

So...

MR. CASS: What I meant by a slightly souped up speciation monitoring site is that the samples being taken at the speciation monitoring site might be processed to get to some of these other endpoints.

For example, you could make eight plus measurements off a slightly modified speciation monitor or the samples collected thereby. If you are willing to composite your filters collected for organic carbon analysis at a speciation monitoring site, you could do organic chemical analysis on a composite of those samples, giving you a somewhat longer averaging time but the chemical detail you might want. Or you could decide to pull more air at a few of those sites and collect somewhat larger samples.

So that with some slight modifications, samples collected at those sites plus additional chemistry would get you to most of these things except possibly the ultrafines, in which case you could consider dropping a CNC into those sites, and now you have got that, too, at a really rather modest cost.

MR. CADLE: For July or, and somewhere in your draft paper, I would hope, too, you will get some feedback from

the health community of what they accept as a lower limit of protection? Because that is going to be very dependent on...

MR. MAUDERLY: We may not be able to tell you.

MR. CADLE: ...on what kind of...well, yeah, but somebody is going to have to draw a line here as to how much air to sample and sample frequency, and what kind of samplers you put out is totally going to depend on your, you know, the analytical sensitivity. So, somebody is going to have to decide what you are going to accept.

MR. CASS: A lot of these nuclear chemical methods are the sensitivity is as much in the lab as it is in the sampler, so that if you want to jack up your sensitivity, you irradiate something longer or count longer.

MR. CADLE: It depends on your method, but if you do the standard x-ray, you may or may not even get some of the metals, but a lot, which is the more common method.

MR. GREENBAUM: Yeah, I mean, this is a fruitful discussion. This is the starting of the concrete kind of discussion we need to have. I am going to take one more comment from Ken, and then I think we are...I don't know if we are ready for lunch or we...go ahead.

MR. DEMERJIAN: This is related to the health community question. In addition to this list, I know that there has been work looking at what are susceptible populations. If you could provide that or at least some general guidance on what those susceptible populations are and then, if there is some packet of activity that provides some insight in terms of how they get exposed,

those would all be kind of worthwhile to consider in designing the siting criteria.

I mean, one of the things I wonder about is in a lot of cities, people spend a hell of a lot of time stuck in their cars. I can't imagine that they don't get heavy doses of particles as a result of that.

SPEAKER: They do.

MR. DEMERJIAN: But they may not be part of the population.

MR. GREENBAUM: Of a susceptible population, yes.

MR. DEMERJIAN: Yeah, but, you know...so, there are groups that you know are getting heavy doses. The question is, you know, can they provide us any insight in terms of some of these problems, or are they just not part of the critical group that we need to be looking at?

MR. MAUDERLY: Well, we can. I mean, there is a litany of susceptibles just like there is a litany of favorite hypotheses, but I think the point that is made in this discussion is the health community doesn't know enough to push you into doing things you can't do. I mean, it is really...we probably don't know enough to push you into doing all the things you would like to do.

MR. GREENBAUM: I think there is a list of susceptibles, and it is actually not a difficult...in fact, I think it is quite evident in the Academy report and other places reasonably well. I think in terms of what the opportunities for exposure for those groups are, actually, as we speak, we are in the midst of efforts to try and figure that out in more detail. There is work underway.

There is work that different groups are about to fund to try and get at the exposure patterns for susceptible populations with the hypothesis that those are probably different from the exposure pattern for the average person in them, on the grounds that if these susceptible populations are elderly, have some form of preexisting disease or prior lung disease or, in some cases, are infants or very young, that their patterns of exposure are going to be different than the average person commuting back and forth to work every day.

And that may or may not be true. We may find that those patterns are similar, but that work is underway as we speak, and I don't think you can say today what those patterns are or what that is.

Petros is ready to give us an answer, but, I mean, he and Paul and others are doing some of that work right now.

It is here. So, what we are going to do now is actually, since the food is here, we are going to break for lunch and then try and reconvene at 1:30 or even sooner.

SPEAKER: Let's do 1:15. That is an hour.

MR. GREENBAUM: Okay, my watch is fast. All right, 1:15.

(**WHEREUPON,** a luncheon recess was taken.)

MR. ALBRITTON: For a couple of reasons and time just going on, we are going to pose a slight change in the sequence or time put on things here. We have covered the health-related exposure picture, and I think we got a lot of very specific things out of the comments that will help us really improve the next version of the draft.

Our suggestion for the next step is to spend...to focus significantly on this objective number 2, because understanding the

linkage between what the sources are and the receptors is an important element of being able to, after seeing that there is an effect, after making decisions to take action regarding those effects, then, decision makers and industry have to know where the knobs are.

If we reduce X here, what do we have to vary in terms of Y? We would very much want to get input from this group about how to improve our write-up and, as we did this morning, get into much more specific detail that we can build into the next write-up.

So, what I will do is to go over this objective number 2, and then we are going to propose that, in terms of management strategies, we are going to ask for a few broad comments, questions of time scales of health impacts, time scales of monitoring.

We will also move through the last objective about using specialized sites for implementation development. We will maybe move through that rather quickly and ask for broad comments on that.

We heard generally broad agreement with that little set of cross-cutting points that I showed on my overhead, the last one, in terms of what are the parameterizations of monitoring, publications, the inventories of sites, and so on. The reason we are doing this is we would like very much to spend adequate time for speaking about how to get from here to a constructive and useful workshop in July.

So, in recap, I am going to, in a moment, put up our source-receptor relations and see what the group's thoughts are on that. We will then move through those, and we will try to get into the agenda of the workshop and the approach for the workshop and any action items we may have between now and the workshop for any of

the groups and spend a good bit of time on that.

Does that sound a reasonable approach in terms of our time available?

Understanding sources and understanding their linkage to the impacts in receptor areas, as I mentioned, I think is going to be a very important part of going forward in the key on health effects research. We had put in the draft three scientific questions that are somewhat classic with source-receptor, and, certainly, the experience with ozone and other issues led to the formulation of those.

I also have added here on the side the parameters of these questions that we would like to get viewpoints on, and I have added the point that Glen Cass mentioned before lunch that as we move through these objectives, one would want to know how they relate to each other and how can you get double payoff and what things are common to both, and that is looking at the commonality side of it.

So, we listed three things here. Aerosols, say, unlike ozone, have primary and secondary stages. Linking source-receptor must understand those relations between primary and secondary and which is causing which health impacts.

The second point is, because of the size range, the concept of very local sources and transported aerosols are an important aspect of the source-receptor relationship, and, thirdly, if we are going to link the sources and receptors very well, what are some of the major, major processes that have to be better understood? In particular, how can measurements help elucidate those?

It is very similar to the approach of ozone. Let me open any of these up for comment from this group, and what we are looking for is, is this a fairly complete set of questions? But, more importantly, in the spirit of the way we evolved just before lunch, let's think of some very specifics that would be involved in a measurement aspect that would begin to directly address these, and, importantly too, what are the health perspectives from a source-receptor standpoint?

Perhaps not as much as our first objective, but this is the reason for getting the mix here together. Let me open it up, then, for comments or questions.

MR. MEAGHER: I was going to comment about the timing. I think we had a fairly extensive discussion this morning about the frequency of measurement, what impacts or what use they would be put to for the health effects data, and I think the same question needs to come up here.

Just to maybe start the discussion, my experience is you really need some fairly fine time resolution data, certainly better than 24 hour data, to be able to resolve some of these source-receptor relationships, and I don't think that these 24-hour average numbers are terribly useful in trying to do some of the...answer some of the questions that we have here if, in fact, these are the right questions.

So, I would suggest that there may be a time requirement here that is different and probably of a higher resolution than you might need from a health effects side if we are going to meet this objective.

MR. ALBRITTON: Good point, because it

begins to differentiate how...the hierarchy of measurement types, the chemical speciation and the longer-term averages and then the shorter term.

MR. DEMERJIAN: How about the conversion of gases to particles in terms of understanding the relationship of emissions to the receptor sites?

MR. ALBRITTON: From a measurement perspective?

MR. DEMERJIAN: From trying to equate the source versus the receptor when you have gaseous emission and a particulate receptor. I don't know. Just the conversion. I guess the conversion of species, the conversion rates.

MR. MEAGHER: Would it mean I would have to measure precursors in order to be able to understand the transformation, not just measure the end products? Is that what you are saying?

MR. GREENBAUM: Right, right.

MR. SAXENA: Dan, since you asked for specific suggestions here, for number 1, I think one thing that has been used successfully for at least distinguishing primary and secondary is the elemental composition of organic traces, which I know DRI and Glen Cass have begun to do.

MS. HERING: Properties of.

MR. ALBRITTON: Particularly the organic signature?

SPEAKER: Right.

MR. ALBRITTON: What about eastern U.S. and western U.S.? Are there any, in source-receptor relationships,

any primary changes of characteristics that would make those different problems?

MS. HERING: I mean, I think if you are looking at transformation processes, you have to ask whether...what secondary aerosols are formed through your homogeneous reactions and which ones or to what extent are the heterogeneous droplet reactions important, and I think when they are important, they dominate. So, identifying that is...

MR. ALBRITTON: So, from a measurement standpoint, how would you phrase the need there?

MS. HERING: The things that, from a measurement point of view, time resolution and size distributions are your two keys, I would say, to identifying and, preferably, speciated size distributions which, of course, are expensive, but...

MR. ALBRITTON: That is what this topic is focusing on.

MR. CADLE: There are seasonal issues, too, especially if you think about a Denver winter brown cloud versus more traditional summer issues.

SPEAKER: This is backtracking a little bit, but are there seasonal issues in the health...

MR. NEAS: Yes. I would say that that is the...

MR. ALBRITTON: Yes, we do cover that time slot.

MR. NEAS: The most important single confounder of the particle health effects is the seasonality.

MR. ALBRITTON: So, well-differentiated

seasonal signals of species, examples like EMIPs. You can trace that modulation into health settings.

MR. NEAS: The issue I raised was that we have to remove all the seasonality when we look at the health thing, because everyone knows that more people die in the winter than in the summer in Western countries, and, you know, we have to discard all that signal.

MR. MAUDERLY: But one of the problems being that when we discard it, sometimes, we don't know whether or not we are discarding an important seasonal particle signal, too.

MR. NEAS: We could easily be discarding that signal, but to be conservative, we...

MR. MAUDERLY: Yeah.

MR. ALBRITTON: Kurt, did you have a comment?

MR. ANLAUF: There may be a...and I am sure there is...a strong biogenic component to particle formation that needs to be differentiated as against anthropogenic.

MR. ALBRITTON: And that is probably going to tie strongly into an East/West gradient determination, because you have a natural soil suspension in the West, and in the East, you have a very high natural organic emissions.

MR. FELDMAN: Going even back earlier as well as here, I guess one of the questions is, is the routine meteorological data that is gathered sufficient to answer these questions, or do you need enhanced meteorology in association with this?

MR. ALBRITTON: That’s certainly a factor in

experiment design.

MR. NEAS: With respect to the weather, that is also an important consideration in the health analyses. While the NOAA weather system is wonderful, having all the airports monitor, they're often combining a weather signal that's generated at an airport with an air pollution monitoring system generated at another site. While you wouldn't expect there to be very strong gradients of temperature across, because of the airport, it would at least be good to get all of this data properly aligned and in the same data set. So that the epidemiologist would be provided with all of the weather data and all the air pollution data in the same data set with all the elements of the data set properly aligned at the time.

MR. ALBRITTON: Let me see if I can phrase that. You're saying that the arrangement of weather data has not been always done in the way that most favors the epidemiological studies. Could you then supply us with some suggestions of what we can indicate to the weather service, what would be useful for this particular application? Can you give us some characteristics, not necessarily...

MR. MAUDERLY: It's not so much how measurements are made, but where they're made.

(**WHEREUPON,** the panel members talked among themselves inaudibly.)

MR. MAUDERLY: The people in this room, we're a subpopulation. But in Boston, the airport is out on the water. In Albuquerque they've got such quirky geography that it's totally different.

MR. DEMERJIAN: It's more than just the

airport sites that make up the, it depends on what parameters you're talking about. So, I mean, if you're interested in temperature and precipitation fields, there's certainly a much more dense network of those data, than just at the airports. But if you're talking about a ray wind sign, if you're interested in three dimensional paths of winds and direction, then you're right.

MR. NEAS: No, just temperature endpoint.

MR. ALBRITTON: What you're saying is that epidemiological studies have a very special meaning for meteorological data that are often not part of what are seen as well as certain properties. I'm going to talk with you off line and get some specifics.

MR. COOK: I would think that too, to support modeling that you would be interested in collecting species that go with the models, so there's compatibility between the collection effort and the modeling effort, so that time resolution is appropriate and that the species of interest for the model would be taken into account by that.

MR. SCHEFFE: Dan, what does that say, model input...

MR. ALBRITTON: Species format need to be a consideration in taking the study up.

MR. SCHEFFE: Could you maybe cast that as model evaluation needs, for instance you might want to measure some diagnostic variables.

MR. ALBRITTON: Sure.

MR. SCHEFFE: Like intermediates, proxy radicals, nitric and dioxide, things like that, that wouldn't be

considered inputs to a model, but certainly you'd want to use them to evaluate the...

MR. ALBRITTON: It may have no environmental significance, but it may be crucial to understanding how the particle model works.

MR. FELDMAN: Then you said the E word, emissions.

MR. ALBRITTON: Emissions databases.

MR. FELDMAN: You want to know about emissions source-receptor relationships.

MR. DEMERJIAN: In your source profiles, whether you need absolute negatives in the ratio and so forth. Depends on what kind of model you have.

MR. ALBRITTON: Right.

MR. GREENBAUM: Can I ask a question of the community on the source-receptor models? On one level, I've been thinking of primary versus secondary aerosol and figuring out how those get formed is one thing. Some of the, some of what might ultimately come out of the health are some of the fairly specific drivers of health effects. I'm wondering what resolution of source receptor modeling you would expect to be able to achieve. Let's say there are one or two metals for example, that came.

MS. HERING: Well, that would be an easy one.

MR. GREENBAUM: Or some of the organics and not others. I'm wondering, in terms of modeling source-receptor relationships, how fine, I mean I understand the NOX, the OC discussions, and ozone, but this is a much more complex system. It

may be the most important thing to know will be some very small subset of this or a few small subsets, depending on what the data allows.

MS. HERING: Well, I mean my guess is that the organics are going to be your most troublesome one, because we don't even know, we don't even have an easy way of saying, what fraction of this is primary and what fraction of it is secondary. Sulfates and nitrates, you can easily identify almost entirely as secondary. Then you only, and you know what the precursors are, then you just have to worry about speculations such as mine, is it formed in the assays or is it formed in cloud droplets or wet droplets. You have to start looking at mechanisms, you need three dimensional width and things like this. Probably things that would be beyond the scope of what would be done in this study actually, but it's done in other studies.

The organics, I think, I mean there's, through tags they're able to pull out some of the primaries, but then and maybe by difference begin to get some idea of the amount that's secondary.

MR. MEAGHER: I think it goes back to the question that was raised earlier, that is, as the polyorganics are formed...

MS. HERING: But they can still be secondary.

SPEAKER: What about collecting data in a manner that is suitable for an annual average model as opposed to the shorter term?

MS. HERING: Well, I think actually the basic speciation monitoring sites are going to get you so far, just in terms of knowing how much is organic, how much is sulfate, how much is

nitrate, how much is soot. That's going to get you a long, long ways just knowing what the average chemical composition is. That's kind of already on the table, and I think that's the most important thing, in terms of your source resolution. You at least know, get some idea of the relative importance of NOX and SO2 emissions, and...

MR. DEMERJIAN: You're going to have to know that by season at least.

MS. HERING: And you're going to have to know it by season. But every six day author will give you that speciation. I mean that's the first place.. Then it becomes, well, how do I control my nitrates. Well, that becomes a more difficult question. But the first step is to identify that that's what you need, to reduce your mass.

MR. CADLE: If you focus only on annual average, that's because the current form of the standard is going to drive the States that way, but the health effects may end up saying that that's not even the correct parameter. So, I think you don't want to focus too much on that.

MS. HERING: Annual average is seasonal average. I mean, there are definite seasonal compositional differences. Doing it by season is just a straight forward, I mean you'll have that data.

MR. ALBRITTON: I think a point that was mentioned earlier, the regs are looking for the annual average, how reliable, what kind of data would show the reliability of the model in predicting the number that's important to the regulation process.

MS. HERING: I think, you're looking at me. I mean, I think you have to look at the seasonal composition.

MR. SCHEFFE: This question comes up a lot about we have an annual average that is going to drive things. But the tools have really, really small time resolution in them. The air quality simulation models, the emission inventories, those are based on minutes, seconds, hours. So, that begs the question that you need data in order to test those tools. So, I wouldn't let the fact that we have an annual driving standard get in the way, in terms of what kind of time resolution. We need high time resolved data for those tools, if nothing else.

MR. NEAS: I forgot to mention a fourth type of epidemiologic study, that might bear on the annual average. How long would this monitoring system be in place?

MR. ALBRITTON: To be determined. It's to be determined at the various levels. I would understand at the core sites, looking at mass, are planned indefinite for the future.

MR. VANDENBERG: It could be quite a while, we just don't know.

MR. NEAS: The reason I'm asking is the fourth type epidemiologic study is the six city adult cohort, the American Cancer Society study, where you look at long term exposures to particles. Will a single year's annual average well characterize people's long term exposure to particles, or would the community be willing to live with that particular year of all possible years to characterize the entire United States?

MR. GREENBAUM: Well, let's put it this way. The folks in the ARE only use it one year. So, if we get three, we'd be ahead of the game. But it's not, and I think...we're going to get into the longer term question in the next group, we have got to

evaluate, so...

MR. MEAGHER: Just to turn the debate, the discussion a little bit from the what to the where, I think I'd make the case that in this particular application, besides the timing of this data to get what you need for the health effects, the locations may be a little different too, because I think it's important to do urban / rural contrast here to look at the issues, especially with transportability and look at the source-receptor relationships. We have to be monitoring places which are not places you would normally go to do adjusted population exposures. I would argue that we should consider to address some of these questions, looking at monitoring areas that are more regional in nature, as opposed to global warming sites. Obviously those need to be done for the health effects study, but these are more contrast areas.

MR. ALBRITTON: Any other comments?

MR. GREENBAUM: It's getting harder and harder to get in here. We're going to try and go through this relatively quickly, compared to what we have in the agenda. But this third objective that was laid out is one that often gets short shrift in some ways in these processes. Yet is one that in many respects is important to both in our view the monitoring needs, the air quality needs and also the health monitoring needs. That is the evaluation management strategy. By definition this is a long term objective. It cannot happen in a year or two years. Obviously the primary question is what effect do changes in precursor emissions have on measured aerosol parameters over some period of time. You cannot do it immediately. What will you have over the long term? In terms of improvements in air quality, you might have some cases where you

have things get worse. There is a comparable question that's been asked frequently in the health community, which is, what are of the effects on measured parameters for health outcomes? Do we have a way of measuring whether we're actually getting benefits, improved health outcomes as a result of this?

There are a couple of key questions for both of these. The first is, over what time will these measurements be necessary and feasible? How long will it take us to do that, to actually be able to get a report of this? My guess is we're talking about decades here, not years. But we should talk about that. Then the second is, given that, how can these efforts be sustainable? These are not just science questions per se, but implementation questions. I'm wondering if people have comments on this issue, on how we go about doing this. I'm drawing it back more specifically to what this may mean for the siting of monitors, the development of monitors, the development of monitoring and operating systems, so that they are sustainable. It's one thing to be able to do this with the sort of core FRM system, but the question will come, do you need to have much more than the core FRM system. Let me ask the question actually, as we start this. The assumption about the FRM system is it's going to go on for a long period of time. What about the speciation monitors?

MR. SCHEFFE: Yeah, the idea of the 50 trend sites, is that they do go on forever more or less. In fact, I would say they're more likely to go on forever than any other component in that work.

MR. GREENBAUM: Including the FRM system?

MR. SCHEFFE: Well, think about it. I don't want to speak, that's one person's opinion. Let's just end it there. No need to embellish it.

MR. GREENBAUM: Okay, that's all right.

MS. HERING: I was just going to say, your points two and three really relate to the next issue, which is why it's, I mean the need to do this over a long period of time is what points to being able to get speciated measurements as inexpensively as you get a NOX measurement right now or as easily and automatically. That's quite doable and it's why, one of the reasons that the work issue is so....really, I mean it's either that or you do long term, the other possibility is you can do long term and you can, long term monitoring, why, you know, how accurate is a one week sample compared to seven one day samples? It would be a lot cheaper to get, but how accurate is it?

MR. GREENBAUM: Other comments?

MR. COOK: Question with regards to the secondary particulates. I think it probably goes without saying that there needs to be accurate assessment of those aerosols that you may have to translate to the FRM now. In terms of tracking changes over time, for volatile constituents, we're going to have to have accurate measurements, in order to be able to correlate emission reductions to the air quality measurements. So, there's the accurate measurement. I think in terms of sustainability, I think one of the things from a monitoring standpoint that always enhances sustainability is automation and getting away, as soon as possible, from manual methods, to the extent you're getting comparable data. So automation I think is a big part of this.

MS. HERING: Yeah, be accurate, cost effective, yeah, and accurate measurements, as Jeff was saying, that California would likely get credited more when it reduces its nitrates and it might not show up in the FRM measurement.

MR. KOUTRAKIS: Let's be careful about talking about methods. I mean, we have to protect this committee from conflict of interest, and miscounts happen many, many times. I would say if investigators are involved in the development of instruments, don't propose them or talk about specific things, because I think that's going to just undermine what all of us are doing, so...and I can take notice of many, many cases where this could be true..

MR. GREENBAUM: Yeah. Right. I thought I heard general statements about the need to develop the technologies. I mean...

MR. KOUTRAKIS: Actually she was more specific on that one.

MR. GREENBAUM: Right, we're not going to point to specific ideas. Okay. Other comments on this? We're going to take just a few.

MR. VANDENBERG: Dan, just to make sure I'm clear on what you added to the first question there. My understanding of the question before was, you've got changes in emissions, you've got changes in the concentration of the air, including FRM mass. Is the second part you're saying, you've got changes in emissions, you've got changes in public health outcomes.

MR. GREENBAUM: Well, that's the theory. I wasn't suggesting that this monitoring system was going to give us

the answers to that.

MR. VANDENBERG: Okay. Well, that's what I was wondering.

MR. GREENBAUM: I should've been clear on that. I was putting it up there to show that there's a convergence of interest here that's been expressed on an ongoing level and there is, I think if we start thinking about this in the long term, we need to be in a position where we can't just say, where we cannot only say, yes, we've done these things and the levels of PM2.5 or the levels of sulfates have gone down by 50 percent. But in some manner, which I don't think we have the answer to yet from the health community, we can also say, and we have seen the following improvement in health as a result of this or haven't seen.

MR. VANDENBERG: I think that's consistent with comments we've had from CASAC before on this. We should look for opportunities to see those improvements. Maybe in thinking about the design of the overall particulate characterization effort, where might we best see those improvements announcing themselves?

MR. GREENBAUM: Right. Well, I am actually going to hand out at the end of this conversation something that came from a little workshop that you organized last November, which was the recommendations from the epidemiology panel, which actually had a page on some thoughts about how to develop epidemiology studies based around monitoring sites that could integrate those two over the long term. I think we do have to keep that alive here, recognizing that the, this is really about designing the monitoring system and keeping, developing it, and making it

sustainable. But the other piece has to be there as well, if we ultimately want to be able to know whether we're having an effect.

MR. DEMERJIAN: I think there's some lessons to be learned from our history with the ozone problem. I think, it's kind of interesting that someone had the question how long we're going to do those measurements. Well, I guess if there's going to be a PM2.5 standard, which there is, and that we're going to measure it until it's achieved, if the ozone is an indication of what it takes to do that, we've probably got at least 25 years or so, to deal with the problem. I personally think this problem is going to be even more difficult to deal with, and so I think that, I hope that we don't repeat the mistakes that we made with the ozone problem, which was we measured it for about 20 years before we decided that that wasn't enough, we needed to actually measure the precursors, when we just started to do that. I hope that we're not going to repeat that mistake.

The other thing is, I'd like to say that this idea of accountability, I see as ultimately a responsibility we as scientists owe to the public. I don't see how we can keep marching down these paths of saying, let's spend billions of dollars to presumably improve the quality of the air and never be able to demonstrate there's any benefit to society.

MR. MAUDERLY: Here, here.

MR. DEMERJIAN: We've gotten away with that for almost three decades, and I can't image the public is going to continue to put up with it. So, that's why I think it's very important that this program be designed in such a way that we do have some clear health points that we can point to, so as we progress down this tortuous path of about another 20 years, which I think is what it would

be, that we'll be able to at least say when we reach the end that it has had significant impact on the quality of life for the general population. I don't think that's ever been done, at least to date on environmental issues.

MR. GREENBAUM: Well, I think that's true and I think when I wrote down how can these efforts be sustainable, at bottom I think what I was aiming at was less at the question of sustainable monitoring for basic air pollution elements, because I think it is very likely we will have 2.5 monitoring, we will have speciation, we will have certain things going on over some period of time to be able to track trends. Probably the hardest piece of that to be sustainable would be the databases so that you could see whether there's a relationship between trends in the air pollution and trends in health.

MR. DEMERJIAN: I think it's very necessary in this process to be able to demonstrate progress. I don't think we can go and tell, whether it's industry A, B or C that they have to do this kind of control and there's this anticipated impact of that control, and then never be held accountable to demonstrate that that was accomplished. That's basically pretty much what has happened historically. We have on paper described a variety of things to do with regard to managing the ozone, but we have little, very little to show that what we did was effective, or why it was effective or why the fact that we haven't attained the standard and what's the reason for that. Because there hasn't been data that has been available to track that progress, and that's an essential part of what I think the future of this network has to be, is to have that capability, to be able to show as we take prophylactic steps, we're in a position to

demonstrate it works.

MR. GREENBAUM: I think there's a lot of agreement around the table, that the health piece of this, given the size of the health benefits we're talking about against a quite large background, trends in health status, is not a simple thing to tease out. For example, if you wanted to show with reductions in ozone a reduction in asthma hospitalizations, you would, over the last 25 years, you would be playing that against a much larger increase in the incidence of asthma, which is, probably what you'd be able to show, if you could show anything is, a reduction in the, what would have been the rate of asthma hospitalizations, because undoubtedly there's been an increase in the rate of asthma hospitalizations. So, it's a very difficult fact to deal with. I'm not suggesting that the air quality monitoring community is going to be able to answer that, but it's something that does tie these two together and it is a concern.

MR. NEAS: To what you just said, I would add the size of the susceptible population is projected to increase considerably. Factors like environmental tobacco smoke, which is, you know, perhaps adding noise to the signal, is decreasing. So, you might actually see a better air pollution signal in 20 years, with those kinds of reductions.

MR. COOK: I know we talked about meteorological inputs earlier in the previous one, but this is one where we are tracking changes over time that it is essential to be able to deal with the variability in meteorology, just to maybe underscore the importance of having a lot of measurements connected to the service ratings.

MR. GREENBAUM: Okay. Any other

comments? Let me just pass this out. This, as I mentioned, came from the workshop which EPA hosted here, actually in Durham last November. I've excerpted the part that epidemiology needs.

What you'll see here is the whole epidemiology needs and the next to the last page, on what is called page 24 in this, something called highest priority. It really was talking about a development of a comprehensive surveillance system around a set of community based platforms to accomplish certain things. Some really nice ideas I think, but they are very much relevant to what this group will be talking about. So, I thought it would be useful for this group to have that as input into this. Also describe four or five different kinds of epidemiologic studies, that might be done around such community based platforms. I thought it would be a useful piece of input for this.

There are others here who were actually in that discussion. Lucas and John I think were in that discussion. I was actually in another room, wrestling with Paul and Petros and Linda. So Dan, do you want to take on the next one?

MR. ALBRITTON: The fourth point that we wanted to seek comments from this group on relates to measurement ability and the use perhaps of specialized sites to investigate that. We had three points in the write up, and I wanted to seek comments on a couple of them. The first one, the first comment is, what's unavailable in the suite of measurements that may likely be needed in understanding aspects of gassed particle conversion, also source-receptor relations. But I've added, Joe, over here on the left, I want go back to a point you mentioned. That is, are the understanding of the health processes and impacts, I think I interpreted your comment

as, that you're not at the state yet that you could say you must develop X or a new measurement to test this hypothesis or idea that the development group has. That is, if you look at this suite of measurements, which can generally be made now, if they indeed were made, you'd have a rich data set and there's not an item on here that says, boy, I sure would like for you to measure compound X. Am I interpreting that correctly?

MR. MAUDERLY: Yeah, that's correct. All I was saying is that the health community is still working on fairly broad categories.

MR. ALBRITTON: Yes, exactly.

MR. CADLE: Does that statement include the bioavailability of the organics or the metals or the, I don't know if there are standard techniques available for that?

MR. MAUDERLY: Not necessarily standard. As a part of understanding their toxicity, certainly bioavailability is. But I'm not sure how it relates to the measurement system.

MR. CADLE: Well, I guess I'm asking, do you want total metals or do you want bioavailable metals when you measure the metals?

MR. NEAS: I'd like total oxidative potential.

MR. MAUDERLY: I guess I'm intrigued by how you're going to measure bioavailability in bioavailable metals.

MR. NEAS: Well, I think what we questioned is something we might want. That's extractable on a PM level.

MR. SAXENA: One way to deal with it is as he just said, is extraction of one metal from the rest. That can be from organic to non-organic to benzene.

MR. CADLE: As far as how it's done, that's just the issue I'm raising. Do you want total metals or do you want a different measurement here?

MR. MAUDERLY: The frustrating part of this is that we can't really tell you. It's easy to say we want everything you can possibly give us, because somewhere in there is the divine truth. But the fact is we're not smart enough now to tell you very much about what you should be chasing. If you have this even at a crude level, it would be light years ahead of what we have now.

MR. ALBRITTON: Absolutely. That's the impression I've gotten.

MR. MAUDERLY: Now be assured that just as soon as you start producing these data, we'll be asking you for more. That's what makes it interesting.

MR. ALBRITTON: Question here?

MR. DREHER: Having worked with ambient air associated metals, what's emerging in new experiments coming out of our lab is that composition is a critical aspect of the toxicity of the metal. I've called a number of people in the atmospheric chemistry arena to see if one can actually do metal compositional speciation. I think that's a frontier that maybe research ought to explore.

MR. KOUTRAKIS: You mean resolution in terms of oxidation state?

MR. DREHER: Well, oxidation state or whether it's sulfate or nitrate. Not so much oxidation state alone. There's evidence that the constituent it's associated with has a dramatic effect on the toxicity of the metal. These are constituents that are associated with, what, ammonia, nitrate.

MR. ZWEIDINGER: I'd also like to point out about bioavailability. I can remember back when we started doing work with diesel particles, that there were a lot of arguments over the nitro pyrenes for instance, in saying, well, this work has all been done with extractions with methylene chloride. You don't have the methylene chlorides in your lung, but lo and behold, they found out some stuff like that when they started doing animal testing, and bioavailability might be kind of a nebulous issue as far as how you determine what is and what isn't.

MR. MAUDERLY: Well, the adduct study is a quite complicated story, and that's pretty thin ice for you to be treading on. You find the same adducts being exposed to carbon black.

MR. ALBRITTON: I think point #2 here, we'll skip over, but clearly is something that we can comment in our specialized way on in terms of the implementation technology. #3, I'd like to put down a suggestion that perhaps one of the more important things that an intensive instrumentation site or measurement period could do, is check the operational methods that are used in the regulatory set of measurements. So, under a variety of field conditions, perhaps job one, in terms of instrument science, would be to compare various devices that measure the same thing that are being measured under the operational regulatory networks. Is that a generally agreed upon point, that that ought to be a very high priority in measurement science? Doing it under different conditions, different places, and seeing how robust is the simple device that looks at that.

MS. HERING: You know I've run, 10 years ago

I ran, was a field manager and therefore wrote the protocol for a number of field comparison studies. Then actually sponsored another one this last summer and having, they just generate a wealth of information on how well, how differently different instruments perform under a variety of conditions. I'm a firm believer that you have to test things in the field.

MR. ALBRITTON: I would also extend that into speciation sites. Yes, Rich?

MR. SCHEFFE: I just want to make, mention a peripheral benefit of this whole, using these platforms as comparison sites with routine instrumentation and then advancing into more, other techniques in the future. A lot of what we're trying at EPA to do is to facilitate dialogue among the research community and the state and local operators who are really running these networks. By paying serious attention to this platform, this transitioning element, that's more or less a glue that's going to really draw the attention of the state and local agencies quite a bit. So, I think this is, I can't overemphasize the importance of the interest in this particular element of the program. I just wanted to mention that, that it is strategically very important in terms of fostering this whole dialogue with the rest of the community.

MR. ALBRITTON: Jeff, you're supposed to say, here here. From any of the measurement folks, any other comment?

MR. VANDENBERG: Just to understand that last point. Is that the sort of work that would need to be done in a multitude of locations, or is it one place that you could have a variety of instruments come in? I don't know.

MR. ALBRITTON: My hunch, multiple places. Having been stung more times than I'd like to admit on a seasonal or a location dependent artifact.

MR. CADLE: Does the air comparison also include the analytical values?

MR. ALBRITTON: It should be ambient air.

MR. MAUDERLY: Dan?

MR. ALBRITTON: Yes.

MR. MAUDERLY: There's one point, I'm not sure if it fits exactly with what we're talking about here, but somewhere in this mix, I think it ought to be stated that not only are we interested in information about what's out there in the air, but the health community is very desirous of samples that they can get from you to take back to the laboratory. So, somewhere in here that needs to be part of the agenda.

MR. ALBRITTON: For example, Dan Greenbaum was telling me about the techniques of pre-concentrating constituents in air and then using them in laboratory tests, say with animals. Then clearly being able to take such samples from sites that are so well characterized, as the chemical speciation sites, or one of many type of sites we're talking about here and supplying that to you would be doubly useful. I think that's what you're talking about.

MR. MAUDERLY: That's an example of one part of what would be useful. But those concentrators of course don't concentrate everything, not even all the particles. I'm saying that not just particle concentrators, but the ability of the biologist to tap into the measurement network and say can you give me this, can

you give me that sort of thing, is an important consideration in designing this. It isn't just putting particle concentration or concentrators at these super sites. That will only answer a certain range of questions. There may be other questions that that wouldn't get at at all.

MR. VANDENBERG: Joe, are you saying that this is, you're actually talking about material from the filters, for example, that could be used in in vitro experiments.

MR. MAUDERLY: Yes, exactly.

MR. VANDENBERG: In vitro or in vivo.

MR. BACHMANN: And that means maybe a special instrument designed for that.

MR. GREENBAUM: Maybe the volume you need.

MR. ALBRITTON: One question here.

MR. DREHER: One issue of this, which hasn't been addressed is, the issue of particle collection and what that does to the altering constituents. In your monitoring of these detailed sites, you're going to know what these are. If the scientist takes those particles back to the lab, he's going to know what he lost. That's sort of a subtle...

MR. MEAGHER: Well, I guess my comment was almost the same. The value of having these filters, for the material to be used for later testing in these sites not only increases the data available, but also helps to characterize it in a more comprehensive way, makes that sample more valuable for what you're studying.

MR. ALBRITTON: What I had mentioned on

the plan here would be to open it up and leave that in terms of beginning to get comments from this group about the approach toward the July meeting.

MR. GREENBAUM: Yeah, I want to start, we had done some initial thinking, but I wanted to not in any way proscribe us here. I think the concept here was to try and get out on the table the sets of issues, the sets of design parameter questions, the sets of objectives that we've been going through here, that in some cases overlap and in some cases might conflict with one another. But in all cases probably have something to say about how one goes about designing a monitoring system that actually provides, has the best chance possible of providing these kinds of, the kind of data that we all in our particular pieces of this need. The questions, I think the issue is how do we organize a larger group of people who will come together to actually engage in that discussion in a way that we can come out at the other end with some constructive ideas and information.

I wanted to first sort of open up broadly, if people had some comments, some questions. I know I heard some stuff over lunch, some ideas about what might or might not work there.

Our goal here was to really just get out on the table some of the questions, to get this document that you have taken to another level. We've started that process, and we're going to need comments on that document, so that it can be at another level. For example, I think it would be, it's able to be, the document will be a step forward, because it will have some of this kind of information elucidated in it, and we will use that as a starting place for this. One question that I think has come up at our circle here and I want to get out on the

table a little bit, because I want to make sure people, we've talked a lot about super sites, the whole monitoring system, what is a super site. There's some level of discussion which sort of presumes we're going to have six or seven or five platforms, very specific platforms. There's another level at which we've been discussing that we will have perhaps augmented platforms within a, very much within, nested within the context of a larger monitoring system. I wanted to, but I think there was some concern about, are we just talking, we talked about this earlier, are we just talking about a set of monitors that we're going to collect data at and we won't have studies, but rather do we need to design the studies first. What I'm trying to get ideas for is how do we, I think people agree, we should be designing the studies, we should be thinking about them from the point of view of what we need to have, and then sort of what should be falling out of that is the needs for a monitoring system. But I'm wondering how we should organize this larger meeting in getting ideas from people on how we organize this larger meeting, so that we actually can accomplish some of that, some of those goals. Both the laying out of what some of the elements of design studies would be, because I don't think we, as I said earlier, we can design a study specifically in great detail. But then how do we then translate that into guidance for a monitoring system? So, let me start with the first of those questions, which is, how do we ask the questions about what we want to get out of this, in a way that really gets people engaged? What do we do with the documents we have here? How do we take this to the next level, so that we can in fact get people engaged when they show up here? Then secondly, what do we want them to answer? What questions do we want them to answer when they show up at this

workshop?

MR. KOUTRAKIS: I want to reiterate what I said earlier, because I really want to talk to you about this whole concept of the supersite. I think if we ask the wrong questions wrong, we're going to get the wrong answer. I think it would really help us to focus a little bit and see this as an opportunity that happens once in a life and try to take advantage of it. I think, it's my feeling, and I can go through details that you cannot design a study that's going to include epidemiology studies, toxicology, or exposure assessment or you say the word. I think it's going to be very difficult, I mean, when you call for epidemiology persons, you might want to do a six city study with 14 years of measurements. If you do a sector hologram study, maybe five campaigns would be nice, an exposure assessment, maybe two months is enough. So, I think we are compromising a lot here, and I think if we would just talk a little bit about this more, and say, well, we want the theme, to change the theme from five super sites and say something like use the state of the art sampling and diagnostic techniques to help us to enhance our understanding of all the physical, chemical, biological properties of aerosols and use state of the art technological measurements. So, the theme is field investigations, okay, instead of super sites. This is not a network, as somebody said, and I agree. This is a field investigation, how we can use state of the art, expansive field studies to do epidemiological studies, air pollution studies, exposure studies, toxicological studies. Maybe if we can do that, we can go in each of these boxes and say, well, what is the state of the science here? What do we need to accomplish here? Once we lay out the objectives for the different disciplines, we can say, well, we need three sites or

we need 10 sites, each of them would be distinctively different. Otherwise I think it's very hard, I have been hearing this from either CASAC, NRC, I see it in their comments, just tell us what you want to measure and we'll go out and measure it. It's more complicated than that, and I think other people just alluded to that. I think we just compromise if we don't just step aside and say, there is issues of epidemiology, there is issues of toxicology, in receptor modeling. What kind of agreement, and first we need to do that, and what kind of process are we going to address. And if we do that, I think it will make the workshop and the discussion a little better. That's all I have to say.

MR. GREENBAUM: You were saying...you were suggesting that there's the issue of first thinking about the kinds of studies we need to design and there isn't one. Thinking about designing a measurement system that might include super sites, might include separate, but a measurement system that allows you to get the data you need in order to do those studies.

MR. KOUTRAKIS: Field investigation. But one site might be good, for instance, if you're in Boston or in New York. Maybe you can give data to Rick, maybe you can give data to Paul about exposure assessment. You might just do a simple monitoring. So, we cannot expect that all the sites will address the epidemiological studies, the exposure studies, but let the sites think about it, and to propose that. What we have to do is how we use technology and field measurements to address specific questions in the different disciplines. You use the same pages we wrote here, it would be the same, it's the same questions, but now you're free to develop a network, develop a concept, which is easily implemented,

it's easier to give us.

MR. GREENBAUM: You do need some kind of clear organizing concept, both from the point of view of understanding how all these things ultimately fit together and also from the point of view of selling it as a package to get funded, just being very practical.

MR. BACHMANN: Yeah, I guess I just wanted to, at this point to say that what Petros is saying isn't inconsistent with the thinking that went behind having something that we came to call super sites all along. The original concept that was derived, Rich and others derived it, was focused on the mission of the regulatory side of the house, which ultimately supports states in helping define source-receptor relationships in areas that are of interest, we expect, five or 10 years down the road for implementing standards. Now in creating that and saying that we were going to do supplemental chemical studies, people got confused as to what that meant, vis a vis speciation sites and the road team network. So, we tried to make it concrete with something we call super sites. Never intending that super sites themselves would become a network, because I could see that you might have four to seven separate entities around the country, which themselves compose, I mean the original idea was, take scags on the road in essence, which sounds like a bad rock group. But it's the idea that you could organize these things. What we came to understand as well, given the resources for research in the areas of exposure, epidemiology, toxicology, it was almost criminal for us to go out with that kind of money and do those kinds of studies, independent of all those other needs. What we're trying to do here is make the most out of all of it. So, what Petros is

putting forward, the idea and what I heard Glen Cass say earlier is, which is, start thinking of this thing more holistically in an area by area sense and what you're trying to achieve in each of these areas, as long as part of the theme has to do with source receptor, which does unify to some extent all of them in interesting places. Interesting places being high health risk, high concentration, whatever. I think it's absolutely consistent with what we were all about to start with. If the idea of super site network is getting in the way, get rid of the idea and redefine it.

MR. GREENBAUM: So, is it fair to say that you are in some ways, what you were suggesting was, you're going to layer a series of measurement systems across the country at different levels, growing levels of detail, but then there would be certain thresholds of activity in certain geographic areas, where you would be able, which would enable you to look at even greater depth at some of the health questions, look in greater depth at some of the source-receptor questions, look in greater depth at some, at some of the technologies.

MR. BACHMANN: If the resources could be applied to help unify some examinations in those kinds of areas, that would be beyond what our part of the budget was going to do with so called super sites, that would integrate the part of the budget that was going to be chemical speciation, as well as the part of the budget that Jim Vickery or John Vandenberg or others are putting out for some other, for things that are just flat out called research, including the States, yes.

MR. COOK: I'm just, I'm a little unclear on what the difference would be. Are we getting at the same thing,

coming from two different positions, or not? If I were to design, just from a monitoring standpoint, something that is to go into high concentration areas with high populations, having looked at existing ambient networks, having looked at existing field studies, epi studies and so forth and go in and say, put a single site in here with the options of doing satellite sites or something like that and have that as kind of my paradigm, how different is that than what you would be suggesting? Can we get to a different place?

MR. KOUTRAKIS: I think, I'm not sure that the same design can be done to address all the different disciplines. I mean, that's my point. In some cases you might want to do more spatial, some cases you might want to take an airplane and go from one place to the other and try to... One example, I can tell you is that everybody talks, I think the speciation sites would really help health effects. I mean it's a free bonus, and I think we should take advantage of that. The difference between the speciation....

MR. GREENBAUM: It's free?

MR. KOUTRAKIS: It's free. And the speciation of the super sites is a timed resolution. Now let's say we went out and we did a site in Philadelphia. If we don't have epidemiology built in that study, the program monitors and the kind of questionnaires that they can't capture that kind of variability, we cannot do the study prospectively. The same thing with toxicology. So, you really have to have an integrated program every time you go out and see who are the users as compared to...I'll give you a bad example that always bothered me. EPA voted to build platforms, they call them, in Baltimore, they were calling people around, begging them, oh please, tell us you will do epidemiology, we will give you

the data so we can just fire our programs right away, which I think was a horrible thing. You don't do epidemiology, by the way, you do scientific projects and you focus and you maximize and you do it in a way that's cost effective. We are trying to do the same thing right now. I'm not yet convinced that, you know, that the parameters that the physical scientist needs to do source apportionment, single particle analysis, and source tracing. It's very, very different kinds of measurements than Kevin Dreher wants for to do toxicology in North Carolina. So, if we try to do that, we take a totalitarian approach to this thing, which I think has to be the opposite way. We have to tell what the needs are in each discipline. We have to define the source, and let the scientists tell us what's going to take us to the next level. We cannot sit inside this room and decide how people will do science. That's not possible.

MR. GREENBAUM: Jim?

MR. MEAGHER: Just to make sure I understand the comment. If the program as a whole has these objectives, I think what you're saying is, that we shouldn't try to meet all the objectives at all the sites. What we should do is have a program objective that has epidemiological properties and things like that, it may work out in some places, but it should be second, not first.

MR. KOUTRAKIS: Exactly. And ask the questions. What is the question at each site?

MR. MEAGHER: I don't have any problem with that. That's exactly what I think. But what do we do differently, to get back to Dan's question, about the way we deal with...

MR. KOUTRAKIS: I would rely on discipline.

Instead of saying tell me please what you want about what we're measuring, I would say, in the field of source-receptor modeling, what are the questions, and we give them.

MR. MEAGHER: So, maybe break out the groups in separate, the objectives sort of do define in some sense the different areas of investigation and let those areas go, somewhat independently and decide what is best, to answer those questions. Then when it's all done look and say okay, we need this kind of site to answer this question, and by the way, that might also work for that. If it does, that's fine; if it doesn't, we do something different.

MR. KOUTRAKIS: If EPA had a workshop, it would absolutely be the same thing. They would group by needs in epidemiology, toxicology, and we should have receptor modeling, and they have to define what the needs are.

MR. GREENBAUM: Yeah, although I think one thing we don't want to lose track of is that we've already seen a little bit in the discussion of the first objective here, the benefits of having the monitoring people and the health people to cross fertilize the...Paul, do you have something?

MR. LIOY: It seems like we are running around in circles about either sites or data needs. Let's come to grips with the fact that in July we want people to ask specific questions about what are the measurement needs to answer questions A, B, C or D, from the different components of this community. And it can be source-receptors, exposure, health. We're going to end up with some super sites and we're not going to be happy with that idea. Because they're going to be six sites and we're going to be unhappy with what we're going to get there because no

one is going to be able to manage it, no one in this room has thought about, if we set up sites, who's going to manage those sites, who's going to make sure... No one has expressed the fact that this is not a single...it's going to take a long time. So, is the investment of time and effort better, more well spent to take up on Petros's point, to identify specific questions that we need to have answered, and then decide how to, you might say, make superior measurements in certain locales for X amount of time, to achieve answer to those questions, which at a minimum could go a long, long way to help us define source- receptor relationships. I think that's crucial, because that's where we're going to have to make control strategies as soon as five years. We're not going to effect change, we're not going to do very much epidemiology between now and 2001 that's going to change our opinion about the standard. We will be able to do something with these type of sites, that can allow us to get a handle on what are the major sources. I'm really not looking for some source that produces one percent of the mass at this point, or maybe one percent of one percent of the biologically active components. I'd like to know what are the big hitters, because those are the things we're going to have to deal with.

MR. GREENBAUM: I don't think there's much disagreement about the need to have some of that. Susanne?

MS. HERING: To me what might be a nice focus for the workshop for us, the trouble list that we've got from Joe, the 10, 8, 9, 10, whatever it is, and you could start with the hypothesis that, you know, the observed health effects between particulate matter, observed end points or whatever, but particulate matter health effects are widely due to one of these factors about

particles. Then we list those as, I mean, one or a combination of these, you know, we've got co-factors as well. That would be sort of a focusing hypothesis. I think then the next question, you know, when you've got a source, looking at sources, well, it's probably too much to ask, but can we design a study that's going to give us the sources of all of those things. But we probably can look at sources from particle mass, #1 up there, at least of the major constituents, and that means just doing the basic speciation, okay, and doing some characterization of the organics. So, I mean, without going into a lot of detail on the source resolution, my sense, I could be wrong, but my sense is that looking at possible health effects from these 10 things and then doing the basic chemical characterization, are the driving immediate research questions. Then building for the future, which are the third and fourth points, okay, which have been addressed. I think focusing the hypothesis on those 10 would be...

MR. GREENBAUM: Well, that's certainly one of the driving set of questions that we have. There's also the source related things, may or may not be the same type questions. Glen, did you...

MR. CASS: I was just going to say that although it's certainly true that it might well be the case that if we were to sit down and design a study to address health end points driven by particles characterized according to that list of 10, the measurements we make could very well look very different than the measurements you might want to make if you were trying to verify the performance of an aerosol process's air quality model for example, the sort out, source apportionment questions. However, I have a feeling that there may in fact be more overlap than you would think at

first glance. The basis for that is simply coming from the observation that what the epidemiologists have chosen to do at the monitoring program in Erfurt in East Germany, has been to assemble a measurement package purely on the basis of epidemiologic considerations that looks an awful lot like the instrument package that I would want for defining the atmospheric characteristics that I'm trying to verify an aerosol process's transport reaction model against. Given that one occasion where I've seen, you know, a package chosen by the epidemiologic community that looks a lot like the package that would be chosen by an aerosol process's modeler, I think that you may in fact find that there are experimental designs that could be chosen independently and for good reasons, that have a lot of overlap between the two communities. I think that could be demonstrated. That's not the only way that things could turn out, but it's one of the ways it could turn out.

MR. VANDENBERG: Does that suggest that at the workshop in July one approach might be to have certain key epidemiologists in fact perhaps even building from the workshop in November, come in and say this is the package that would best address the hypothesis?

MR. CASS: I think it might be useful for someone like Petros and some others to take that list of possible causal agents and say, well, what kind of epidemiologic field measurement and personal assessment program would I want to undertake to deal with those issues, and have some people, like myself or other folks that do air quality modeling, you know, maybe Ken, come in and say here are the kind of measurements we would like to have to verify or to check our aerosol processing models

against. It might well look like the field protocol from the scags experiments or something similar to that. Then let's see how much those two different requirements, you know, have in common. They're not going to have everything in common, but they'll have some things in common.

MR. GREENBAUM: Someone wants to put out sort of a strawman to look at. That's an interesting thought. I mean, there's a third piece of that which would be, one of the things that's come out for me today and I think it becomes very clear that from the sort of health side of this, the data that has been available is very different from the data that will be available, even if we never do a super site. In other words through the speciation process, et cetera. I'm wondering whether one piece of work would be to do a comparison of what those needs are as they came out of discussions, against what will become available with even the free speciation data that Petros, the free bonus that we're going to get. I know somebody is paying for this stuff somewhere along the line. I think maybe in the tax bill we pay. But somehow one way to get at what's necessary, above and beyond, i.e., what's necessary for superior measurements or at super sites or whatever you want to call them, or whatever they end up being, would be to just do that sort of comparison you're talking about and then to compare it to, well, what will become available if just the basic system that we're talking about goes into place, and then it raises the question of augmentation, expansion on top of that. I think that's an interesting thought. Let's hold that, because we may in fact ask people to try and do that or try and put something together for the day, organize it in a more...the more specific we get, I think in the discussion, the better off we're going to

be, rather than in general terms.

Let me ask a different question, which is, I think part of, you should correct me if I'm wrong, but part of the concept behind the number, the infamous #5 to #7 here, was the concept that irrespective of whether or not you have a single platform in any of those locations, or something that could identifiably be a super site, if one was trying to focus one's investments, more intensive monitoring investments in some number of relatively representative air sheds around the country, that are representative of the diversity of air sheds to be found, so in other words, you wouldn't put all of them in the northeast, you wouldn't put all of them in L.A., for example, to pick two extremes, but you might want to aim at having five to seven air sheds where you were conducting, going beyond the base of speciation monitors and the other pieces in getting this much more detailed. Both for the purpose of health effects, future health effects, for certain, and as you said, particularly for source apportionment kinds of things, because it would give you pretty good information. It's not exactly the same, you know, what goes on in Boston is not exactly the same as what goes on in Philadelphia, and each state will have to adjust around its own specific needs. But there would be some enhanced ability to do that. Is that correct? So, rather than talk about sites, in some way what you were talking about is air sheds where you wanted to do an enhanced level of monitoring, measurement.

MR. BACHMANN: One of the factors where that was kind of the minimum number you would get in terms of having a diverse representation of the kinds of atmospheres, plus we recognize that if you think of it in this holistic way, this sort of

intense component of this thing, there's a limit to what America could put together on the field, the playing field in terms of competent, scientific, academic, contractual, whatever, to do that kind of level of effort. Many more than that we thought was kind of unrealistic. So, a combination of those two.

MR. GREENBAUM: All right. So, I'm trying to get us away from sort of getting hung up on the word sites, with the understanding that it might end up being sites.

MR. LIOY: Dan?

MR. GREENBAUM: Yeah.

MR. LIOY: If you're thinking of five to seven air sheds, then you can say that within those five to seven air sheds you could deal with issues that relate to the potentially biologically active agents that may or may not be one or more, the sources that may or may not be one or more, so that you can get to these issues of, well, is there a cross over or is there basically no cross over between A and B. In some cases you may have some very distinct issues. Air sheds I think is a better way of representing it. I think it's good.

MR. GREENBAUM: Well, it's just, I mean, there are the obvious kinds of questions where you would say, is there a differential sort of, if you have a nitrate heavy mass versus a sulfate heavy mass, which there are certainly different air sheds that have that, you're going to see different health effects. How do you do source apportionment within those things. That would be, it's just a thought. I mean, it doesn't necessarily, I mean we might still end up with a very sophisticated site within that air shed, but you're really trying to nest that in whatever else is going on.

MR. LIOY: It may not be a site. It could be a series of sites that are built around existing....

MR. GREENBAUM: A couple more comments on this, and then I want to talk about organizing the workshop itself.

MR. SAXENA: I think, you know, one thing in response to what Glen and Petros brought up. What if you got a list of what the models would need and what the epidemiologists would need and try to do that? I think what we need to spend our time on is maybe setting up two teams to design experiments, for example, strategies that we can employ around the country, every team working distinctly but interactively on human health studies, also keeping in mind what would already be available at the speciation sites. What I heard this morning was maybe summer camp studies, something that the speciation sites might have a use for. So, I think that may be the way to go, to have some experiments designed by the July workshop by these two teams.

MR. GREENBAUM: So, sort of actually have people sort of lay out what they would like to actually get accomplished, one sort of in the health area, one in the...

MR. SAXENA: And those two teams work together.

MR. GREENBAUM: Yeah. Harold?

MR. FELDMAN: I was going to say, I've heard two different things with respect to super sites. I thought I heard earlier this morning that these were not to be thought of necessarily as specific sites in specific places, and now I'm hearing more like there's one in this air shed, one in this air shed, one in this air shed. I hear them as, maybe it's a question that we need to think about,

what's the best way to work this. Is it that you're laying them out and assigning them to different locations? Do you have one sort of set up in southern California, or do you move them around at different points, as you're doing intensive studies in different locations.

MR. GREENBAUM: Well, that's certainly something we can, I mean, I think part of the concept was that if you were going to invest over a long period of time, that you could identify some number of representative air sheds, you want to stand them on so you could build a track record of information. But that doesn't obviate the need, there are going to be needs for special studies and pieces of that. But I don't know that we know the full answer to that. It might end up, do you have five air sheds you're definitely committing to and two that are more flexible and are moving around, I don't know. I don't think we're saying that.

MR. LIOY: Again, I don't think we should think about, even if it's an air shed, air shed can cover a 1,000 kilometers if we wanted and therefore you do special studies within that air shed and you move it around. Again you're getting back to this site, site doesn't give you much when you have a regional problem or a problem with fine particles. We should have a variety of sources, a variety of possibilities that build up in accumulation. So, an air shed doesn't mean one site, it means maybe multiple opportunities for studies within an air shed so that you can have seven or eight teams floating around doing different things.

MR. GREENBAUM: Okay. Yeah?

MR. ANLAUF: Simple question. Why bias us already towards five to seven air sheds? I'd like to see that number removed entirely myself. I'd like to see the community decide how

many air sheds would they like to see studied, for reasons that they have, as to the health effects that they're trying to study. Five to seven, I know where it came from, but let them determine...

MR. BACHMANN: I think I described where that came from. It's sort of, we have more, we have at least that many different kinds of places in the U.S., not including Canada and Mexico, which I could add at least two more, but we also think, we also were advised at least early on by people in NARSTO, that you could not mount, I mean, you could have more numbers if you want to extend the time. I will tell you that the money we've been talking about, this 20 million dollar pot, ORD could go on and fund things beyond this, so we can talk about things beyond this, but this is two year money, which we could maybe figure out ways to keep going for five years if we are creative about our contractual arrangements, but it's not money that continues forever.

MR. GREENBAUM: Well, there's always going to be some constraint on how many places you can do, based on just sheer dollars.

MR. BACHMANN: I wouldn't constrain us to just this 20 million dollar pot, it's okay to think outside the box, but I'll just tell you that's how it got started as 4 to 7.

MR. GREENBAUM: Part of it, I think you're right, though, part of it is a technical question in terms of, for example, if you wanted to be sure to be developing source receptor models that were reasonably reflective of the range of likely mixes of source receptor relationships you get in different air sheds, the number may be 12 or it may be four, that's the sort of thing that you want the technical community to deal with. But there's also a

leavening of this with how many we think we can....

MR. ANLAUF: Yeah, I just, in the same ways that these 10 hypotheses, it doesn't say limit it to 10, or eight to 10, it came out naturally.

MR. GREENBAUM: Well, if it's not on Joe's list, it's not real anymore.

MR. ANLAUF: In the same way with the airsheds or whatever, let it come up naturally. I mean, if it's 10, well, I can see the practical aspect. From a monetary point of view you have to prioritize things. There might be reasons for having a more specific number in the end, but it should develop naturally as the scientific community discusses it.

MR. GREENBAUM: It's a good point. I mean, I think we should think about how we handle that, so it doesn't feel constraining in some ways. I think on the other hand I think there was some implicit effort to try and say, try and realize that there is a priority setting process that's going to have to go on here, a choice process to some extent about this. John?

MR. SAMET: Just to help me in my perplexed state, is the purpose of what will happen in July to think about the monitoring needs for different kinds of research and the research that would be done based around these sites, the number to be developed? Which is it? I'm also thinking about our, you know, sort of staged research agenda at the NRC before, because what we started with in thinking about issues of timing and how much, for example, one might be ready to jump into a large scale epi study or, you know, think about the source receptor issue, where do we stand? I'm trying to understand what happens in July. Is this sort of getting

started on setting up the monitoring base for this future work and then I'm hearing from John that we've got money for, somebody has money, we the American taxpayer have money for two years and maybe five years. So, how does this fit together? Which ball and glove is this?

MR. GREENBAUM: Let's let Rich...

MR. SCHEFFE: Yeah, let me, I'm not going to answer your question directly, because it's probably not feasible. But let me come back a little bit, and John touched on this a little bit. Originally we called this program Special Chemical Speciation Studies, and it created a confusing message. We transitioned to super sites because it was a little, it was an explicit effort to provide a little more focus. We had the word special and speciation and too many other components of our network plans. Now one of the things, as we moved to super sites, though, to that concept and that term, it was always in recognition to the many other efforts that were going on- the mass network, the routine speciation network, and some of the things that we haven't talked about that much, like NARSTO, like the southern oxidant study, the new PMOs and research grants that ORD has funded, a bunch of the other efforts. So, the thought of super sites was very much to fill in the gaps from some of these other perhaps more routine types of operations that couldn't afford to really be much more free thinking in terms of the kinds of analytes that would be measured and the needs that they would address. So, that's where we came with that, but with the recognition that it would always be coordinated and built off of, or related to very closely, many of the other measurement programs. So, in our thinking, now as we're transitioning back to studies, and I think that's a very good

thing, but we're biting off a lot more too. In doing that, I think we have to keep in mind that there's a lot of other efforts and we have to keep continually thinking about how this pocket of resources, how it can complement some of the other efforts that are going on. That's not to say that we can't influence some of those other efforts as well. But as we get into that area, our whole job collectively becomes a lot more difficult. Now having said that, I guess we did have pretty much a specific focus and this has really grown and it's going much, much larger in terms of how this fits into all of EPA's research programs, and Jim, you might want to comment a little bit about that aspect.

MR. VICKERY: I too see that the interconnections that Rich was just describing and see what we've come up with today as being very beneficial for the broader view that it's taken. For instance, rather than looking at five sites and where do we put those and what can we get out of them, our question this morning, or Jon, your question this morning, we have five, seven, some number of air sheds or areas of the country that we're going to examine, decide that we need to conduct some number of studies, health oriented studies, source receptor modeling evaluation studies, and some set of measurements that need to be done. There are certain things that are given. The one thing that's given is our current mass network, our speciation network that was described earlier. These studies which Rich alludes to. But there's some supplement to all of that, that we have already laid the groundwork for. There is a sum of monies, assumed to be appropriated to us, for something called these super sites. What can we supplement these other already givens with, that will maximize some return for us. In the end, I would hate to have it be something that just says, well,

there's another number of studies we want to do with 20 million dollars worth. Another number of field intensive, that are described in very broad terms like here's the questions we're going to investigate, the general kinds of measurements. I think what's expected of us is to say, well, where are we going to do this, over what period of time, and what measurements will we make there. I think we're going to need to give some specifics in return. So, that's why I like the idea, at the end where we're coming up with perhaps two sets of studies, your getting two different small groups together, to say, well, what measurements would you make, in what locations would you make them. Then we'll have some specifics to see whether or not there isn't that overlap or meshing that we are hoping for, that Glenn was describing.

MR. SAMET: To be real clear, for example, I mean, the funds are to support making measurements and not, for example, for collecting health data or human exposure data.

MR. VICKERY: Or learning mathematical models.

SPEAKER: Or developing models or making indoor measurements or any of those kinds of things.

MR. SAMET: But it's, it seems to me that we really do have a real dilemma then, because you're saying, well, we can design, what we've really said is sort of set up, design our lab, population laboratories for different purposes, whether that's, you know, trying out models or doing epidemiology, whatever you want, that there's an opportunity to

at this point shape these sites, but on the other hand, it's a little bit theoretical from then on, because we don't have the resources to

follow on necessarily in sequence.

SPEAKER: If I can just try one more time. I thought that where we were going to was we would have two different communities describing here's, if we had unlimited resources, here's the principal hypotheses or questions we would like to test. To do that we'd have to make some set of measurements. So, it produced a very long set of measurements at some number of locations over some period of time. Then against that list of measurements, we'll put up the things that we already have that are going to be done for us, they are free or whatever, they're going to be done. Then there's some residual set and that's the set we have to look at and say now, could we design a super sites program to cover that residual set of unmet needs.

MR. SAMET: If you took, if you went to the Academy with a timetable, and say, you know, could somehow the time table for implementation of this program, whatever you want to call it, somehow be meshed with something like this, because there's, if there's no meshing then we're not....

MR. BACHMANN: The places that obviously, I think the places hardest to mesh is epidemiology, because you're starting later. It meshes obviously with exposure time frames and toxicology time frames. If it's...

MR. SAMET: But it may not mesh with sort of the source receptor modeling for sort of our key components either, because those are going to be down the line out of the modeling top 10 there, and we wouldn't know what specifically we're after. Maybe that's not to say that the monitoring program is not going to...

MR. BACHMANN: If we do source receptor

assessments of the ilk that I think we would normally do or were done in Scags, you'll get, there's almost nothing you won't get when you later find out it's really five things or three things. These studies will address those five or three things, because they will have measured just about everything we know how to measure. It will not address the chemical specific exposure studies you're talking about several years down the road. It will address the mass.

MR. VICKERY: I'm confused. Don't you see it tying directly to your air, your research topic three and four?

MR. GREENBAUM: I was going to say that. I mean my sense is that where we, I mean, there's something that these sites or whatever they are, don't happen, all happen overnight, the system is getting up into place. You're talking about supplying the methods here and that was for source receptor stuff, and you're also talking about in the same time frame.

MR. SAMET: Later it fits into five and seven, epidemiology...

SPEAKER: Not unless you have a longer time frame.

MR. GREENBAUM: For the monitoring you're right.

MR. VANDENBERG: Part of the confusion there I think is that you've got several different pots of money. This is part of the overall context, that you're not seeing the whole picture. What you see here in fact is not the whole set of context either. In the academy's report, it was assumed that such substantial monitoring would be done to support such studies that are identified here.

MR. SAMET: But we're really down to the process of, the heart of the...

SPEAKER: You're assuming that this included the budget for monitoring?

MR. VANDENBERG: It was part of this. What we're talking about here...that's what I'm saying, is that it was not part of that. So, what we're talking about in the discussion today, and in July, is in fact looking out for the next number of years, and the number of years is a little unclear, because we don't know exactly where our budget will be, even in the next couple of years, because we don't have Congress's final appropriation. But assuming for the moment that we'll have 20 million dollars over the next couple of years, in the out years, meaning the year 2000 and beyond, we may yet sustain that support, we don't know that. To be able to maintain programs that would in fact support topics 5B and 7B and the other ones that are in the out years. So, we need to set the stage, if you will, in our thinking now, to be able to think ahead for the epidemiology source receptor needs of the future, and ideally have the optimal solution, which is what we're all talking about, that will set that stage, not just thinking about the 20 million dollars, but in fact perhaps a much longer sustained program. If we don't think in the longer term, we may cut ourselves off at the knees inadvertently and we don't want that to happen.

MR. LIOY: Jon, if you take #1 and #2...let's see, #1, #3B at minimum, using John Bachmann's idea of saying right now we can do source apportionment mass, that sort of covers part of #3B, where you're actually augmenting what you would want to have to the actual development of the techniques and application of the

techniques for looking at mass. You augment #1, because you'll be looking at panels of individuals who are susceptible for just mass at the present time. We're looking at the outdoor / indoor relationship, that the type of monitoring that you've done with these superior measurements in these different regions could actually then give us an idea of what would be the sources of concern for PM2.5 mass to these susceptible populations.

MR. BACHMANN: And for personal exposure, you need that timed resolution.

MR. LIOY: You could still use 24 hour. Don't worry about it. 24 hours is fine at this point. We don't have anything at this point. Start at 24 hour and work backwards. Let's start with source receptor of mass and exposure for 24 hour periods, sub groups, that's where these superior measurements could actually augment this study right now and later on epidemiology.

MR. GREENBAUM: Jon, did you want to...

MR. SAMET: I just want to follow up on my comment on the discussion. I actually think it would be a tragedy if the workshop in July were conducted only with the time frame defined by the money you have in hand. I think that has to be clear going in and coming out.

MR. VICKERY: I'd just like to comment on that. You understand why we have to set that stage. All we can say that we had in hand, yearly in hand, is what we have on the books.

MR. SAMET: I understand your reality.

MR. VICKERY: And as John has said, if we, if this body can advise that for instance it recommends a much longer term, continuous commitment to this process and your reasons why, I

think that helps us make that case.

MR. SAMET: In the next orange book it will again say...

MR. GREENBAUM: When I said it earlier, I mean, the other piece of that is, if we end up having the atmospheric monitoring community and the health effects community coming together to support those ideas and coming together around some concepts, it just provides that much more momentum to make sure that really this isn't just an investment in a five year what's wrong with PM kind of discussion, but rather a multi year air pollution advance, in terms of our understanding. William?

MR. WILSON: Maybe it would help to give a little historical perspective, that I have from sitting in on CASAC meetings for the last five years, as we've developed the PM criteria document. One of the great frustrations of many of the people on CASAC was that the epidemiology had to be based on what happened to have been monitored mostly for SIPS related work. There was a big feeling that we could do a lot better in terms of the monitoring for epidemiology. So, when the idea came along about all this big monitoring program and super sites, maybe the health people could get involved in the design of the program and provide a better set of measurement data for epidemiology five, 10 years from now. Now there's a difficulty because the epidemiologists have said, we don't want to design anything for another three or four years, because we want to design for whatever that silver bullet is. So, they're saying hey, we can't tell you what to do, because we don't know yet. So, that's raised a little problem. But in my mind, we have from the super sites the possibility of getting...

MR. GREENBAUM: They start getting work pretty early, actually.

MR. WILSON: ...acute time series work, where we have hourly and 24 hour data and we have the opportunity from the speciation sites for getting the long term data or the effects of long term exposure. But part of the reason for getting into all of this is the feeling of many people on CASAC, that we don't want to be in the same condition 10 years from now, that we were five years ago when all we had was TSP and a few PM10. We have a fine particle standard, but there's only one, the six city every other day is the only fine particle epi that we have. We don't have any epi on fine particles every day and we have the possibility of doing a number of interesting things that might set the stage for epidemiology. So, part of the reason this whole thing got started was because, I think this is part of the pressure from the scientific community, is CASAC's concern that we didn't have adequate monitoring data to do an epi.

MR. MAUDERLY: Which is to say it's a far better thing that we are here and confused, than to not be here at all.

MR. GREENBAUM: I think I'm going to put that up. We're on the right track, we just don't quite know it yet.

MR. CASS: I was just going to say that the small amounts of money that are shown here for some of the activities on this budget would go one heck of a lot farther if that money could be used largely for data analysis, with the cost of actually collecting measurements laid off on the programs we've just been discussing. In other words, the carrot here is to try to be able to make some of the areas in this research plan actually work out by supplementing them with effective measurements made through this

monitoring program, so that all of this money doesn't have to be spent making measurements, it can be spent thinking.

MR. GREENBAUM: Part of this came out, in fact John mentioned this, that we had John Vandenberg show up as a sacrificial lamb in front of the NRC committee and present the information. We're going to have an opportunity in the next month to actually hear in much more detail these pieces. So, the numbers will be, actually it will be taken out to three decimal points in the next one. You make a good point, I think that is right. One more comment and then I want to turn to the workshop itself and what we're going to do with it.

MR. KOUTRAKIS: Two things. Yesterday I was coming from Boston, and behind my seat there was two guys talking all the time. One minute somebody says, well, I have an idea, we named this, I swear to you this is true, we'll name this exposure and we'll write off five million of the books, and I say, oh my God, these people are going to the workshop. I turn around, I do not know these people. I follow the mass and they seem to be doing something else. Well, I think this is something which happened in reality here. If EPA talked this morning, we have a better picture. The picture here is that we want to do more monitoring for establishing a national type of source receptor relationships, which is fine. There's nothing bad with that, and I think we need to do that. But I think it's, and I will oppose this policy, which is like a broken record for the last 10 years with EPA to use the word exposure, epidemiology, health effects to go do something else. I don't see any, we are not doing anything wrong, I mean, we need those data sets. But we have to be honest in deriving the books five million dollars for this, 10 million

dollars from that. Otherwise we are confused and I think we're wasting our time here. You are telling us, we want to do epidemiology, but there is no money to do epidemiology, so somebody else is going to do epidemiology. I think the issue here is how we design studies to do receptor modeling, which is very important and that's what we should focus on, not talking about epidemiology, toxicology...

MR. BACHMANN: So are you saying, Petros, that you don't think that any of these resources or any of this monitoring resources that we're talking about here, these sites, can be used to help toxicology, epidemiology or exposure?

MR. KOUTRAKIS: Not if the epidemiologists are not there at the same time as the toxicologists and exposure people.

MR. BACHMANN: I hear your argument.

MR. KOUTRAKIS: We have to go to NIH and get money. If we tell NIH we're going to do monitoring and it's going to start in six months, it's going to finish in a year, and we tell them, you know. So, basically I think we have to be honest here. We want to do something that is needed and let's focus and do a good design for that. I hate this idea that epidemiology is going to force, EPA is going to force epidemiology. That's not a way to decide this.

MR. GREENBAUM: Well, #1 the concept was to bring epidemiologists and others into this process so we can have some input into it and secondly, I think, I doubt that EPA could ever really kind of round up the epidemiologists. They have a hard enough time with the states and the regulated parties and the other pieces. So, I'm not sure that will work.

But let's turn now specifically to the workshop itself. We've had a couple of ideas put on the table. There was a strawman, which I'm not even sure I'll put up, because it's changed a lot, which is good. Although there may be some good background materials for us to do, in terms of presentations at the outset, so people can get some context. But we've had a couple of ideas, one was this idea of straw person. I wrote it down, I'll be politically correct. Men get a bad name when they get known as strawmen. This idea that it might be useful to give people some concrete ideas about strawmen kind of proposals for what would be studies that would be designed, as a way of getting some specifics out on the table. That's one concept that people put forward. Are there other things, and obviously an important, I think, part of this workshop, needs to be for whoever is there to understand in a really thoughtful way what we are talking about as the base program here, which is 1500 sites, and what that means in terms of data availability and stuff. I think we've had some of that, but I think that will be an important element of this.

But the question is, where do we want to take it with people there, what kind of input do we want to get, what do we want to test. We have a set of objectives we've laid out here and those can be in a document. But how would you suggest, are there ways, how would you suggest we structure something like this?

MR. COSTA: Joe Mauderly will agree, I'm a fairly simple minded guy and I've been listening to this and the context of what I've heard and the context in which you're asking, I guess I'm separated by a common language or something. I'm not sure exactly what's going on. It would seem to me that it would be fairly obvious, I'll put fairly in quotations, that the epidemiologists

could say, based on the experience in the 30 some studies or whatever that have been published, there are likely air sheds that are to be fertile and that they may know that there's a database deemed worthy of study. By the same token, the people who have to answer to another master, the regulatory guys, goes along with what you were saying before, that they have some concept of the areas that are likely to be most fruitful in terms of looking at some of these source distribution receptor issues, monitoring and imbedding in there the super sites and the additional sites and the more conventional sites. But there has to be some conceptual overlap. I mean I think I could name a few places that are likely to be overlapped. On the basis of that, proceed in terms of trying to network those together. I feel like we're dealing with, you know, what's behind the curtain. Sort of like when we were talking about Joe's list of eight things here. We were talking in circles around it and finally someone said, what are these eight things. It's sort of the same thing. I mean, if I were to name some places that based on the limited knowledge I have, other than name areas and I'll just throw these out, Philadelphia, Fresno, Denver, Seattle, Atlanta, maybe Houston, as places that are likely to be very different environmentally, that are urban areas that have different types of transport patterns, where we could get information to do these epidemiologic studies, put this together in some kind of package and we could also potentially get samples to do some tox studies, which I think is part of what we want to do and put all this together. I just see this sort of in a big whirlwind where nobody is catching up to the leader. That's the approach I would take. I mean, if you gave me all the money of our effort today, that's the way I would set it up.

MR. GREENBAUM: You're saying, we've talked now about two kinds of overlaps in interest. One is the kind that Glenn was talking about, where there may well be a set of measurements that epidemiologists are thinking about the range of studies if they were designed would want and that the source receptor people would want, in terms of measurements. But you are talking about a set of overlaps in locations, where people would say, gee, where would I want to test this. Well, if they put that list down, they play pin the tail on the donkey.

MR. COSTA: Toxicologists have a very sort of foggy view that some of these things may be involved. The epidemiologists are one step removed. I mean they have some mice data and all that sort of thing, but they don't have a clue. They keep coming to the toxicologists and saying, what is, what's the latest, what can we try to correlate, what's going on.

MR. GREENBAUM: Epidemiologists actually ask toxicologists....

MR. MAUDERLY: Now the secret is out.

MR. COSTA: What can be measured, in many ways the oxidation states of some of these metals and other things, is way beyond, I mean we're taking a microscope looking at the elephant. It seems to me that the things we need in the next five years, to chase these things down from a health standpoint, to the extent that that can be linked to the more detailed work that fits into the compliance aspect, that's great. But I don't think, I certainly don't need that kind of information right now, to do what I need to do, in terms of addressing some of the toxicologic features of what's going on. It's right up here, it's very simple, in concept, and can be

readily addressed. We're trying to do it. The biggest problem we have is getting cooperation to do it. We keep running up against the wall like, you know, just killing us with details.

MR. ALBRITTON: What if you took that list and measured them in your places?

MR. COSTA: I'd be happy as a clam at high tide.

MR. SAXENA: I think that's exactly the point, Dan. If we took the time to write these strawmen or straw persons, we would find a lot of common ground. We'd find some things different. People like Jim Meagher would like to do some interpretive studies, which you don't get. Again, to emphasize that point, the cities that you listed, if you had taken time to read what Jeff wrote down, they would adhere to it. They are not that different. His list of eight cities or your list of seven were common. So I think if we just took the time to write things down, we would find a lot in common.

MR. LIOY: I guess I can add a little different way. I think Philadelphia is a well traveled road. I need to know more about other areas in the northeast corridor, which have not been characterized, because that's where you have...

MR. VANDENBERG: What's driving the health effects in Philadelphia, can you tell me?

MR. LIOY: No, but I don't know what's driving...what are the health effects in New Brunswick, New Jersey where you now have 75 *u*g/cubic meter of fine particles every summer for the last two summers. Philadelphia, you may not know that.

MR. VANDENBERG: I don't think we're going

to be able to go to every city in the country.

MR. LIOY: The point is, I think we have to look beyond the well traveled road we've been on to make sure that we don't miss other air sheds. You have suburban air sheds versus urban air sheds versus rural air sheds. They are all different. You have air sheds that may be closer to the sources of metals. You have lower transition metals being in the atmosphere in pressured aerosols. I really don't think that the well traveled roads ought to be considered as the lone possibility on air sheds.

MR. GREENBAUM: This is actually a precursor of what I was hoping would go on in the actual discussion. I think what you were positing is that you put in a workshop, actually have this discussion with a broader range of people. You may not come to 100 percent consensus, because there's even the issue, I mean there's another factor in this, which has to do with, if you really want integrated locations, you need to think about capabilities of people in those locations. There's a variety of issues there, but I think that's the beginning of the kind of discussion.

MR. MEAGHER: I think I've heard a very practical approach to solving this problem. It's really sort of a parallel versus serial type of issue. Everybody trying to look at everybody else's problem. I think if the individual objectives of different groups could get together and look at their independent problem, I think it's sort of what Petros said in the beginning. Based on the science of need, what would you do to solve these hypotheses, or to separate these hypotheses one from the other and sit down and write down, what would you measure, where would you go, how would you do it kind of things, sort of as an independent entity and let the

groups that are interested in source receptor relationships and ones that are interested in tracking the responsibilities over time, the ones that are interested in measurements, say what would you do and then worry about the management problem of deciding where the nice commonalities and the best dollar bang for the buck is, as far as taking advantage of existing measurements and parallel studies. Let that happen afterwards. I think this is a very manageable kind of problem and I think that the very debate about where the best kind of health studies are done and how those are done, let that go on, and let it be in whatever form it needs to be in and then have that group come back and say, well, here's what we would do. Then I think people are going to be shocked to find that, I think Glen said before, that when the people come back from the source receptor relationships, it's not going to be as different as people think it is.

MR. GREENBAUM: Yeah, the difference may be in time scale of measurements, et cetera, but it's what actually gets measured.

MR. MEAGHER: Right, and then not sit around and debate whether New Brunswick, New Jersey is the best place to do both an epi study or a source receptor relationship. Let them decide on maybe a priority driven basis what the most important things to measure, where the most important things to measure them are, in order to get the best science done and then see where we are. If we don't get any overlaps, we may be able to do it lesser if I have to spread the resources a little farther. But I think we'll find some nice overlaps that are already there and let that happen in sort of the second stage of the analysis.

MR. GREENBAUM: So, there's a set of those

discussions that go on. We're talking about having a fair number of people at this discussion, in this larger meeting. I'm now beginning to think about how you organize large numbers of people into smaller groups, so they can actually have the option for that.

MR. NEAS: Let me speak to that. First, write frequency and duration, under measurements location and frequency of duration. Please don't put all of the epidemiologists and all the toxicologists and all the monitoring people separately. I think that's the wrong way to divide people. If you want the strawman, which is a very good idea, that could be developed by some proper tours in advance that may represent the different areas, to try to present some sort of consensus. Then split up in terms of those three areas, what to measure, where to measure it, the duration and frequency of the measurements. Those might be three groups and make sure that in each of those three groups, there be a mixture of toxicologists, epidemiologists and, because if you put the epidemiologists together, we will talk about epidemiology modeling issues, which forms the basis of the majority of the handout that you had. Finally we get around to, oh, yeah, long term highest burden, we ought to think about doing some real new epidemiology. There are issues of interest only to epidemiologists.

MR. GREENBAUM: I think we had said earlier that we were going to try and avoid that at all costs. I actually said despite that I thought that the long term piece was kind of interesting, despite the fact that it was only epidemiologists.

MR. NEAS: The long term piece was good, the short term was...

MS. HERING: I just wanted to make sure we

don't lose sight of our hypothesis, the scientific hypothesis. We keep on talking about, well, what should we measure and I think we've got four very nicely stated objectives, but the research hypotheses need to be up front of the, what, when, where, how we're going to measure.

MR. KOUTRAKIS: Why, why is important.

MS. HERING: Why?

MR. KOUTRAKIS: Why you want to measure it.

MR. GREENBAUM: Well, I actually when I wrote this...

MS. HERING: Without even saying what you're going to measure, I'm going to say, what's our hypothesis. What hypothesis are we testing?

MR. GREENBAUM: Implied here, that this was not just measurements for measurement's sake. These were the hypotheses for the measurements that the health professionals, the health effects people or the source-receptor people would come up with. This is what we're trying to test and this is, because of this, this is what we're trying to test, these are the measurements we need to make, as opposed to let's just make some measurements and then figure out something afterwards. So, in a sense this is why, where. This is why, this is what, this is where.

MR. KOUTRAKIS: Then you only get to part of the problem. Try one for health studies and one for modeling studies.

MR. GREENBAUM: Right, the two.

MR. ALBRITTON: Back track a little, and see

if this is the model for the workshop we're talking about. Thinking of one group going down this list, which is a what, and incorporating locations from a health standpoint, I'm thinking of a second group, listing a similar set of compounds from a source receptor relation and speaking about where. Then exposing those two to each other and see where the overlaps or gaps might be. Then as a third step, after that fracas is settled, evaluating what we already have out there, like the chemical speciation network and to what extent it solves common problems. Then see if there are gaps of things that do not exist, and yet still have strong overlaps and try to identify those.

MR. BACHMANN: Dan, let me ask, since we have exposure people here, should there be a third group, separate from health, separate from source-receptor, that asks those questions for exposure?

MR. ALBRITTON: Sure, that's a good recommendation.

MR. KOUTRAKIS: Like, for instance, just to give you an idea. In exposure we don't only care about the air sheds, but we care, we believe in a hot or cold climate, because the activity is very different. So, there is, it's not the same issue.

MR. BACHMANN: Where you go might be different?

MR. KOUTRAKIS: Exactly.

MR. BACHMANN: And the care in which you site your monitors and you do, okay, yeah. **MR. ALBRITTON:** Sorry to ask for a personal tutorial, but tell me again what the difference is.

MR. KOUTRAKIS: For instance if you have the same air shed in the northeastern United States, if you live in Boston, if you live in Baltimore, the composition is more or less the same. But in Boston we find that during the winter, during the summer people open the windows, and there is the personal relationship, the relationship between person and outdoors is very highly correlated. In Baltimore they close the houses, or they have air conditioning, there's no relationship between person and outdoor, and still is the same air shed, same composition. So, climate is very, very important.

MR. GREENBAUM: So you do a what and a where for each of the three groups?

MR. ALBRITTON: And as an overlap picture emerges from those three, then we evaluate that against what we already have and find out then what we wish we would have.

MR. VICKERY: That would be the super sites?

MR. ALBRITTON: Then that may be the working definition of what we're talking about.

MR. MEAGHER: There's one piece we might have missed, and that is the concern about accountability and are these measurements impacted in any way by trying to meet that as, I mean, I think we can all agree it's a valid objective. Can we tease out of the information that comes from these three groups what we need to do to make sure that gets done as well?

MR. ALBRITTON: I would suggest treating that is important. But I'd treat it as a sidebar for, because it has, to me a very different set of parameters. It's a very long term issue,

distinctly long term issue that has to be thought of early to have in place. I haven't heard from the health colleagues that there are variables for accountability of improved health that one can define at the moment, that needs to be specially monitored. I haven't heard that. It may exist in, I'm sure it's going to emerge in time. So, I would treat it as a sidebar and make it, in fact almost delegate someone to say don't let this get done, don't let this get missed.

MR. GREENBAUM: There are variables to be monitored in the health community, but I mean, they're not variables that are monitored in air quality monitoring.

MR. ALBRITTON: Yes, but I also, someone mentioned the challenge of teasing out single recovery they're looking for with so many other things that are happening, changes in smoking, in lifestyles and so on.

MR. FELDMAN: In some sense what you've set up here is a 3 x 3 matrix, that is source receptor by these other things. I thought I was hearing before Lucas suggest that you actually break the groups by the measurements, locations and frequency of duration. At least that's what I thought I heard Dan saying, actually break groups the other way.

MR. ALBRITTON: That's what I want to clarify.

MR. FELDMAN: And to me the advantage of breaking it the way Lucas suggested, by measurements, locations, frequency, duration is to really force people to think out of their discipline. In some senses you're now taking them, we tend to divide ourselves by source-receptor and health effects and put them into these bins the other way, forces them a little bit differently.

MR. GREENBAUM: So, you're saying that there would be, we were talking about mixed groups in any situation. What you're saying is that at a minimum needs too will be organizing. It's a little trickier to figure out how you...

MS. HERING: Measurements and frequency are tied together. You just can't separate those two.

MR. NEAS: I was thinking about what, not measurements per se.

MR. GREENBAUM: Right, you could have a group go through once and then sort of meet again and go through a second.

MR. ALBRITTON: Based on our collective comments today, I'm more optimistic first doing it on quasi traditional lines.

MR. GREENBAUM: But with mixed people, groups of people in each discussion.

MR. ALBRITTON: Within the groups, but have the title on the door.

MR. MEAGHER: Because that helps the science drive what happens as opposed to measurements driving the science.

MR. ALBRITTON: It also catches Petros' point about tease out the really science question. Make a program out of it or you can make a science question, rather than a where question.

MR. GREENBAUM: Right. It gets to this group saying, what are the science questions driving the measurements and this group saying that and this group saying that.

MR. SCHEFFE: In terms of specificity, you have the why, you have the what, the where and the when. As you're going down, you're starting from, you know, big open to you're getting a little more specific. Do you want to end up with the how and this gets into maybe some measurement technologies that are recommended by this group. Of course it's located to the measurements and the frequency and the duration of those measurements, but it would certainly help us out. The more specific advice we get from this group, the better. I'm just throwing it out.

MR. GREENBAUM: I would say that what I've heard Dan say was that in some ways the first part of the how is okay, we've said what we need, what do we have in the base, what's the 1500 and the speciation monitors, what are those going to give us, what else do we need. So, that's sort of additional technology. Then I think there's a very important other how, which is how are you going to organize this so that it actually can be sustained over a period of time.

MR. ALBRITTON: But I think the workshop is step one toward that.

MR. GREENBAUM: Right.

MR. ALBRITTON: We're drawing in sponsors from different places.

MR. GREENBAUM: Well, we can see that we've woken people up after lunch, because I'm having trouble getting to all of the hands, which is good. Jim?

MR. VICKERY: Under, in your locations, this is a question. I've heard two different sets of discussions, one having to do with the urban, suburban, rural locations, sort of

general description in that dimension, and the other is, very place specific, Baltimore, Philadelphia, Houston, Fresno, so on. My question is, are we measuring both would be covered, I'm hopeful.

MR. ALBRITTON: I think I would answer that yes. Namely, make up the list, those who think very specific places for a scientific need, then when you come together and here's a region for a scientific need, lo and behold, the place is in the region. So, you get, there's an example.

MR. GREENBAUM: To avoid the sort of reaction we had a minute ago. Locations may be somewhat more generic than, you know, Philadelphia. I think somebody in the room wrote a paper called the Philadelphia Story.

MR. KOUTRAKIS: Are you talking another group that would study samples?

MR. GREENBAUM: Susanne, go ahead, I'm sorry.

MS. HERING: We've heard that, to have an epi study really make use of the measurements that are being talked about, it's good to have that study sort of planned at the same kind of time. What are the chances of bringing in traditional stakeholders or whatever, for looking at, these are specific measurement needs that we would like filled in a study, for which we would like to build on for this other one. Because I mean, here we've got the funding for the measurements, yet we want to pose scientific questions and there needs to be, you know, either more additional measurements or additional work done for source characterization, which cares about three dimensional things, something you don't probably care about

for exposure. You don't care what's happening at 1,000 feet, but source resolution really does. On the other hand, exposure assessment has other issues that fall outside probably the realm of this network. But needs to be...

MR. ALBRITTON: Maybe not outside the special studies.

MS. HERING: Yeah, and so can we bring in potential stakeholders for such special studies for the super air sheds.

MR. SCHEFFE: Yes, and give us some examples.

MS. HERING: Oh, I don't know, EPRI.

MR. SCHEFFE: We expect that. They're there. All those stakeholders.

MR. GREENBAUM: We're trying to do that, and the other thing is, you have a...

MR. SCHEFFE: That's why he's here now and that's why Howard is here and Steve is here.

MR. GREENBAUM: And they also have a specific role for the Academy committee that's going to try and also reinforce those particular things as well.

MS. HERING: Okay, so, my point is covered.

MR. GREENBAUM: I don't know whether I should give you the last word.

MR. KOUTRAKIS: I think instead of saying the why, we're going to have where and how, I think the why also should be in a subgroup. Instead of saying we're going to do receptor modeling exposure toxicology, we should say for each of

these specific disciplines, what kind of objectives we're going to have, what kind of answers will we be able to answer, and what answers we're not going to be able to answer, so we build up the objectives that I think we hear throughout the day here, as a part of this workshop. For instance, in the speciation we said we are going to do qualitative source apportionment, you see what I'm saying, so the expectations are not that high and people don't think we're going to solve all the problems. So, we focus on specific, you know, needs that this network, I don't want to use network, this super air shed study is going to address.

MR. GREENBAUM: So, keep the expectation...

MR. KOUTRAKIS: The group that's going to work on the specific objectives for each discipline, for instance. For instance, this is not going to solve chronic epidemiological problems, because it might be two years. Do you see what I'm saying? But it will solve, you know, real time acute effects.

MR. GREENBAUM: Although you're saying, what you just said raises a question for me, in the sense that we had said a minute earlier that what we have to be thinking about is this being some long term. I would guess that if we were talking about a national investment in a monitoring system that was going to support a long term system, we probably aren't talking about two such investments, one for five years for this effort and another one to go on for a whole other one. So, we need to think about how to keep that alive, and although I understand we can't keep it going.

MR. KOUTRAKIS: You can say for two years we do intensive studies that's going to help the receptor modelers,

but after we go to the rest of the years to doing other studies, less expensive to keep on going on with epidemiology. Be more specific, rather than just say we're going on to do epidemiology.

MR. GREENBAUM: Right, okay. Well, yeah, and I think actually one of the things we need to think about, particularly for this health effects group that's dealing with these questions, is this sort of short term versus long term question and how that gets dealt with in that discussion. I think we're just about at the end of this part of the discussion. This has been very helpful.

The next step in the agenda was for the other Dan to do the easy part, which is to say what's the next step in order to get us there. One thing we haven't, it would be nice to try and do while we're here, is to get sort of people tied to these, people on the committee tied to these particular roles, so you can be starting to think what your role is going to be in bringing this together for the meeting.

MR. ALBRITTON: How about departure times?

MR. MAUDERLY: Some of us will be disappearing in about a half an hour.

MR. GREENBAUM: Yeah, 4:00 o'clock is probably end time for us. So, maybe what we should do is just go through until 4:00 and if we need to do a little after that we can. Of course if they leave, then we can just assign everything to them.

(**WHEREUPON**, a brief break was taken.)

MR. ALBRITTON: Let me, if Jeff's going to be planning it in my mind clearly, the picture we have of the workshop and also now what we will try to aim at in doing there, are three

topical areas that at least we will pose for each one, a set of compounds that relate to that topical area and a set of regions/places that relate to that topical area. Then they would be the components of breakout groups at the workshop, who would then come back and summarize the key points of each of those areas, and we would have them up all three simultaneously and begin to look at where they overlap and where they don't overlap. We would also probably have to deputize an individual or a group of individuals to think about what we already have in place that relate to those three sets of lists. Because in the end what we would like to do is to take the difference between that and define that as the set of needs that we go forward to from here. Is that the common picture we would have in terms of approaching that? Between now and the workshop, we would probably want to generate something, or write up a summary along each of those topics. I doubt that the folks writing thus far can pull all of that diversity of topics together in those three. So, what I think we need to do is to look for others that under those three topics could address the what and the regional/location and prepare a draft that can be given to people before the meeting. So, that at the meeting we would already have some initial ideas to convey in the smaller groups. I think that's going to be a practical way to get from here to there. Comments on that?

MR. SAXENA: Dan, I think that's a fine idea. If you want to allow yourself some room for general agreement, and maybe at least finding some time to see whether there is overlap between those three groups.

MR. ALBRITTON: I will open it then for suggestions of who might carry these three topics forward after here.

Write up a draft or a straw person or other things. Source- receptor. We can always have two. As Dan and I are finding out, we can say oh, I thought you were doing that. Two there. From the health endpoints and impacts.

MR. MAUDERLY: I'll volunteer Rich Schlesinger.

MR. SCHLESINGER: No, I was going to help you out, if you volunteered yourself.

MR. ALBRITTON: Let me...Dan, what did your abbreviation ET stand for?

MR. COSTA: Well, I think right now it's just focused on the health hypotheses.

MR. MAUDERLY: My understanding of this, and I guess it would be useful if we leave with a common understanding, what we're talking about is sort of a capsular summary of what we've just said today.

MR. ALBRITTON: Yes, it is.

MR. GREENBAUM: I think the reason I mentioned epidemiologists, is to the extent that we start in that process, though, of playing out ideas, well, you went with Dan Costa, but ideas about locations, you know, sort of generic. In other words, not just what the questions are, but also where we think we might, what the range of places are.

MR. MAUDERLY: So, in this, in what we prepare, we're supposed to propose locations?

MR. GREENBAUM: Well, not specific locations, but at least generic criteria for how you would go about doing some representation of that.

MR. NEAS: Well, I mean, I think another thing we need is if we're proposing these to be useful for health studies, in addition to the health hypotheses, we need some idea of, a description of the type of studies that might be conducted. So, the kinds of measurements needed to support that kind of study.

MR. GREENBAUM: That's right.

MR. NEAS: There are only three or four different study designs in epidemiology.

MR. GREENBAUM: Sounds like Lucas could help with that.

MR. MAUDERLY: I see this part has three sections. It has the Mauderly, Schlesinger recapitulation of hypotheses. It has the Costa speculation about location, and it has the Neas research paradigm piece. You put all those together and hopefully...

MR. ALBRITTON: Put it together and shake it.

MR. GREENBAUM: Well, in the Neas research paradigm piece, in that piece I handed out, actually there are already four bullets that come pretty close.

MR. NEAS: Yeah, I was close.

MR. GREENBAUM: Yeah, you were involved in there.

MR. ALBRITTON: Exposure. Petros?

MR. KOUTRAKIS: I only know how to talk, I don't know how to write.

MR. SCHLESINGER: There's a tape of what you said. We could try and...

MR. ALBRITTON: Okay, Petros and Paul. Good.

MR. GREENBAUM: I think we have to provide some guidance format, so that what comes back is reasonably consistent.

MR. ALBRITTON: We'll take the items on the flow chart, flip chart, and plot where, get a little bit of that. Now if the model holds up, it would be good to have some group prepared to do the what do we have now.

MS. HERING: What do we have now in terms of the networks that are currently ongoing?

MR. GREENBAUM: Yes.

MS. HERING: Like the dichots, the dichot network. Arizona has one, California has one...

MR. ALBRITTON: We want to dump all this in and look at it, because the difference is going to be what we're going to operationally define as measured effects.

MR. GREENBAUM: Not just what we have now but also what is planned.

MR. ALBRITTON: Although I would hope that it would come up later, in terms of what's being planned, we ought to have some fairly robust feeling that there's a high likelihood that this is going to come down the line in the next few years. Not what's wished for, but what's planned.

MR. GREENBAUM: Right. What I'm thinking of like, sort of at a minium, the trend speciation kind of data. Those seem pretty real or whatever.

MR. DEMERJIAN: Rich, do you know if you're

going to get responses on those network plans of the speciated sites? Are you expecting to get those from your July 1st deadline?

MR. SCHEFFE: We'll get some of those, but they'll be very, they'll be nonspecific.

MR. ALBRITTON: Ask Jeff on this, he's done a good bit of summary already. I mentioned earlier the utility of a look at the health studies that are in place or ongoing. Could we enlarge this, in fact we should enlarge this to include health inventory of others. Do I have volunteers on that?

MR. BACHMANN: A health inventory?

MR. ALBRITTON: Health, major health studies in turn.

MR. GREENBAUM: Although it's a little tricky. I mean, we have a document, that Jon and HEI put together, it's in the book, and there's a whole bunch of things that sort of are in the wings, you know, proposals that are sort of in the midst of being reviewed and possibly funded, but by July it's not clear how much more we will have in terms of beyond what's in the...

MR. ALBRITTON: I see this as an aggregation effort, that is, taking someone that's knowledgeable of what lies in these various documents and places, and putting it into a little coherent story, that allows us then to compare what we would like to what we have.

MR. COOK: Dan, question on the existing capabilities, what's the world that I'm dealing with here, is it everything that's measured? I mean, is it gases, is it methyl, is it carbon?

MR. ALBRITTON: I think it's the fuzzy list

that we have by hearing the comments today. That is, what measurement programs are out there, what networks, what sites that relate to this type of list and the kinds of places that we've heard talked about. I don't think we need to make it too fine grained on net support radiation measurements, but as it relates to here. I think Glenn has got a comment on that.

MR. CASS: I was just going to ask, are you looking for the list of the existing ongoing monitoring programs of a routine nature that bear on that list, or are you looking at a catalogue of the measure of methods that's never been demonstrated, whether or not they're ongoing today, that bear on that list, and some studies are sort of here one day and gone the next. They're executed for a period of two months and then they go away.

SPEAKER: The former are of interest...

MR. ALBRITTON: Except I think you apply sort of a routine network and I think that those are reasonably easily captured, it's the sort of research or monitor or reasonably termed researched ones are more difficult to get a handle on.

MR. COOK: She was talking about methods, too. Are we interested in cataloguing methods or just parameter location durations?

MR. ALBRITTON: Pradeep actually had a one pager and it's in your handout, maybe it's a two pager that lists methods and their current state of either research mode or monitoring mode.

MS. HERING: Actually, I was just more, just what chemical speciation data is being collected fairly routinely right

now and what fine particle mass data. The thing that came to my mind was the Dichot networks that are in place in several states, there's California, at the depositions network plan. These are things that have been ongoing for some time. I think these are assembled.

MR. VICKERY: I strongly suggest that you put Jim on that group, because he's already been doing a lot of work in terms of inventorying some of that existing information. It's just that it would fit in with what he's doing. I know that puts him on two. You could consider crossing him out and maybe we could twist somebody else's arm to be up in that group. I know EPA would certainly volunteer Paul Solomon to be in that source receptor group. There's certainly other capable, more than capable people in this room already that could be in that group. Jim, of course could be in two groups.

MR. MEAGHER: Yeah, I look forward to it.

MR. ALBRITTON: Jim, is that okay? But I do want to return to the idea of getting documented the major health oriented studies, that can better define what we have now. That's good inventory to explore in July.

MR. VANDENBERG: I guess to balance that...

MR. ALBRITTON: John, would you...

MR. VANDENBERG: Yeah, but I'm not sure how much further we're going to go than what was already in the appendix to this.

MR. ALBRITTON: That's probably a little more fine grained. Maybe we could talk off line and you could educate me about the terms and I could talk you into doing something then.

MR. VANDENBERG: I hear your pain.

MR. ALBRITTON: Now we will, as Dan Greenbaum mentioned, we will try to get out some comments about guidance. International is going to be very important. We had mentioned to you earlier about suggestions about invitees and to get that kind of perspective into this would be very, very important.

MR. ANLAUF: And people with existing capabilities, you want that, too.

MR. ALBRITTON: Yes, very definitely. In fact, if you could get to some of these, some information similar to the breakout sheet that Jim Maurer had in the handout for here, about what the Canadian perspective is and Jim Vickery, you and I need to think about who do we need to pull in from the Mexican perspective on our study. So, why don't we take an action item?

MR. BACHMANN: But a summary of Canada's existing and planned networks, as well as the other thing. Obviously there's a report out of ten years of that in the ALMA journal just about a year ago.

MR. ALBRITTON: I'm going to flip this. If there are no other topics of this sort of weightings and then think about mechanics for our July meeting. Thinking of the sequence of things. I had heard maybe one breakout and then a plenary reporting. I also heard the suggestion that maybe a remixing after that, and we ought to look maybe if people still have time, what would be the range of thinking here about the mechanics.

MR. GREENBAUM: Actually before you turn that, I just thought it would be useful to give people an idea in terms of time when we think the first cuts of these reports will be necessary

to come back. We have a responsibility of these pages. We will need to get back to you within probably a week at the latest with some specifics. But I was just thinking in terms of having enough time to get something back and then turn them around.

MR. ALBRITTON: Yeah, that is a good question. I had missed thinking...do we want this group to comment on some, on the initial drafts of this, before we go out, send it out for the workshop in July?

MR. GREENBAUM: Yeah, or at a minimum you want the people who have written the different pieces to see the other pieces and understand how they fit together.

MR. ALBRITTON: Probably yes, so that does make the calendar important. Thanks for bringing that up, I'd forgotten that.

MR. GREENBAUM: So, if we got something out sort of by this day next week, I don't know, but if we got something out to you by the 26th, that we gave people to...

MR. ALBRITTON: What's the date on that, Dan?

MR. GREENBAUM: The 26th.

MR. VANDENBERG: Giving us guidance of what you're looking for?

MR. GREENBAUM: Yes, and then...26th of May. In other words we give them, everybody the guidance by the 26th of May.

MR. ALBRITTON: Drafts back to us?

MR. GREENBAUM: The 19th of June would be just before the next meeting of the panel. That would still give a

month before, except we want to also turn it around and then get it back out to people and actually be able to send it.

MR. ALBRITTON: Yeah, I think we ought to, at a minimum we ought to do this. Have these drafts back to us and to this group and have a comment, a first order commenting period back and then we try to work up from that set of comments the draft that will be mailed back out to this group and the attendees at the same time.

MR. GREENBAUM: Okay. Then the 19th will work actually, the 19th of June and then that gives us a few weeks.

MR. ALBRITTON: So, back...

MR. GREENBAUM: And then we would have to be prepared to turn them around and get them back out to people. We'd have three weeks after that, four weeks actually.

MR. NEAS: Would it be possible to set up a notice group so that things could just be posted publicly?

MR. GREENBAUM: I'll let somebody else...

MR. COSTA: We have a web site actually for this, if that helps.

MR. GREENBAUM: We can figure out some kind of, I just want to get people who have to write anything to have a sense before they have to leave of timing and then we will send out notice, somehow.

MR. ALBRITTON: The first question, what kind of context setting would be useful? What we've learned here, what kind of context setting would be useful for people coming to this for the first time? Jim?

MR. MEAGHER: One of the things I think, we

had some discussions earlier about these parallel workshops that's going to be held.. I think we should get measurement methods and capability indications.

MS. HERING: Actually, I would...

MR. ALBRITTON: Very similar to what we did here, we'll have a short report.

MS. HERING: I like your, I would say in the context area there are two questions. One is, the scope of the number of years we're talking about, otherwise we think we're just here for the short term. So, we have to set that longer perspective and I think you have to set those four objectives. I mean where we started today, except give us some idea about the time frame and also, I don't know, maybe it's inappropriate, but some idea about total budget. I mean all of us are accustomed to having some rough idea of how much things cost. I don't know, for instance, how much you're talking about speciation network. I hear it's a lot smaller than this 20 million dollar number, but I can easily see it costing nearly that much from what I've heard. So, maybe some idea about the whole picture.

MR. ALBRITTON: We get in a lot of trouble when we talk about a budget that hasn't yet been released, approved and all of that. I'd much rather talk about the scope and breadth of the network, what kinds of, where these locations might be, what type of communication...

MS. HERING: And how much you can afford to do. I mean that we can translate that to numbers, so that's fine.

MR. ALBRITTON: Okay. Maybe a few indications of scope here.

MR. SCHEFFE: Sure.

MR. GREENBAUM: Well, for example, on Petros' presentation this morning, there were sort of expected measurements and then there was some optional measurements that we talked about. Laying out what perspective, sort of what you could count on being part of this and what probably is more....

MS. HERING: Yeah, I guess the big question is frequency on what you're going to do those measurements.

MR. GREENBAUM: That's the biggest question.

MR. SCHEFFE: Actually thinking about it, I probably can talk quite a bit, I might be able to give you some more of the specifics about it, because it depends...I don't think I can talk about 2000, but I can talk about 1999. Because that's sort of general information that's out there. So, we might be all right.

MS. HERING: And some idea about what you know about now and maybe intentions for the future.

MR. SCHEFFE: Sure.

MS. HERING: So, to get people to think along the longer term.

MR. ALBRITTON: We'll have on the label great expectations. But let me ask this, would the group see as practical short summaries from each of these papers, now that they have read, before they break out into working groups and that is, to have a plenary quick summary through each of the four activities, certainly the three activities and then give a charge to the group and break out? How does that sound, as an approach?

MR. VANDENBERG: Keep it as short as

possible. I think the real work is done in the break out.

MR. ALBRITTON: It will be certainly in terms of those. Then of course I think we would break out here. Now I'm getting to the point that I had asked Petros, but he's gone, in the closing. Would you want to see, do you think that likely we would want two break outs, if anything for cross mixing? That's a lot of breakouts to do in two days, particularly say if this took late into the morning, we worked in the afternoons in break out mode and since we're going to ask these groups to summarize the next day, they would be jotting some things on overheads overnight and would be giving these summaries the next morning. We would have a plenary give and take. We still want to look, we still want the whole group there, to contrast what we would like, or what we need and what we have, to spend some time debating that. I'm a little worried about two break out sites.

MR. SCHEFFE: Then you're already at the workshop and we have these different groups that are going to talk about source receptor and health and everything. One thing that, there was a lot of confusion, I think, in this meeting. This was a small meeting compared to that workshop. If we don't have a straw plan, that gives, that is just out there, maybe it's not even on the mark, but it's something that people can really chew on, in terms of getting somewhat specific in terms of locations, measurements and all of that, some things that people can really respond to and help direct a little bit of the focus, I'm a little concerned that we don't have that vehicle in place right now, because I'm not sure of what these individual papers are going to look at, that talk about source receptor and all that. Unless perhaps you and Dan are going to get

together, take those pieces and somehow meld them and also build a straw plan out of that of some sort. That hasn't been discussed yet.

MR. ALBRITTON: You mean a synthesized picture of where the overlaps exist, what kind of synergies could be exploited. What do you think, Dan, is that something that a couple of us could do in anticipation of iterating by the...

MR. GREENBAUM: You're saying that's something that came into the workshop.

MR. SCHEFFE: Yeah, I was actually talking about...

MR. GREENBAUM: Something more concrete.

MR. SCHEFFE: Yeah, being fairly bold. Here's the straw plan of what this program is going to look like. We're going to measure A through Z in cities J through K, that sort of thing, just throw that out, take some risks.

MR. ALBRITTON: Okay. If that, that certainly, because it puts things up to...

MR. BACHMANN: If you want to put an e.g. in front of it, that's okay, but something that makes it, we had a problem today focusing and Glenn raised that question first, because of the lack of the concrete and also a little bit adrift because there's so many degrees of freedom we have.

MR. GREENBAUM: I think part of our goal would be to have the pieces that come back to us in that process, but then the question is of whether you can even synthesize that in some ways, so that it's more tangible.

MR. ALBRITTON: We could take a shot at it, based on what we've heard here, we could come there or even send

beforehand, that's just a little more bold. Or at least present there the key elements of where we go, as a draft plan.

MR. DEMERJIAN: I think the problem you have then, Dan, is if you do that, then it's kind of counter to why you're having these groups break out in the first place.

MR. GREENBAUM: That's what I'm working on.

MR. DEMERJIAN: You're asking them for advice and then you invite them in and say by the way, here's this crap that we just thought of.

MS. HERING: And you can kind of anticipate results in that. The epi people are going to want as detailed of measurements in as many cities as you can do that are really different, because that way they get more data points essentially. You get one data point per city is what I hear in these studies. The source resolution people are going to want a lot of detailed measurements in one point. So, with upper air measurements and everything, so, you don't understand what the sources are in that area. So, the location issues, I think what you measure is not going to be that different among the different things with the location issue. To some extent the frequency one is going to vary a fair amount.

MR. ALBRITTON: It is, but aren't we prepared, we should be prepared to take what we get? That is, if there's a very strong overlap between things here, we take advantage of that. If indeed these two, these three topics don't have a lot of overlap, that's life, that's what we have and that will certainly influence and it will certainly alter research approaches and planning

and things. But this is a way of finding out the answer to that question.

MR. BACHMANN: I think if you can write it in a way that, you know, what we're talking about is writing it in a way that is again, for example, so that people have something to work with. They're not wedded to if you put it in Philadelphia versus New Brunswick, for example, you're not wedded to it. You're wedded to a concept of an eastern sulfate dominated, whatever, some kind of thing you can write it so that it doesn't take away the real contribution that we expect everybody there to make. We're not hamstringing them, we're just trying to give them something better to put what this thing should look like.

MR. ALBRITTON: In fact, John, I think you made a point that already identifies there is a difference in thinking, and that is the exposure and health related studies think horizontally and source receptor tend to think vertically for understanding's sake. That's just the nature of the two different things.

MS. HERING: Yeah, but they do intersect.

MR. ALBRITTON: They do intersect. That's why we're here. Let me return to Rich's point, which is a very good one. It's the classical dilemma in these things. Is it better to send and present something in a draft, relating to the topic you're asking people to come and work on, is it better to do that and run the risk that, hey, look, they've already made up their mind. There's that, and then there's in some way getting a cycle of input and then trying to come up in almost real time a plan. What are the various comments on those two paradigms?

MR. FELDMAN: I think what you may want to

do, if this is the day and call this day one right here, day two in the morning you may want to present a plan. Somebody could be drafting it ahead of time and may be influenced by what comes out of the breakouts and then you bounce that back off people.

MS. SHELDON: I think one of the reasons there was so much trouble getting focused here is that it was not described very well as to what the purpose of this monitoring and the whole structure of everything was about. It doesn't have to be a straw man, but it is critical in the first 10 to 15 minutes at the meeting, the idea that we are establishing a network where we are supplementing it, the original intention was for source-receptor modeling, however, we have expanded that based on the Academy's report, and now we are looking to collect data that supports a number of such studies, including the source-receptor, et cetera. I don't think it was clear to people as they came in here. It wasn't clear to the discussion in the afternoon that that was the concept. So, I think that that's very important.

MR. ALBRITTON: Two points on that. One is, it is a lot clearer in my mind too, now, after we've gone through this. Secondly, the other point is, we definitely need to tell the group in July what we're going to do in July. So, what we will try to craft is a description of the July workshop that will have improved from the discussion we've had today, and get it to people before the workshop.

MR. GREENBAUM: I think in this context piece that we were talking about earlier, we now can flush that out quite substantially, I think, and lay that out in a different way. Part of this issue of whether we have a straw person up there or not is whether, depends on what we get back in from the groups that are

writing these and how firmly we feel we should do that. It may be that, I think there are some, I mean this whole thing about air sheds that I brought up there, sort of, it was listening to the discussion that that was sort of a way of bridging across people. There may be a way of presenting sort of basic elements of this, which are not sort of, like we've made up our minds on how this is going to happen, but at least give the context in which people are then going to be focusing their comments and understand how that's going to work.

I also think the other thing that's really, was very clear to me at the end of the day today that wasn't at the beginning, is that certainly the research community should see even what's already planned and fairly likely to happen, as a major opportunity of moving forward for enhanced data availability. What we're now talking about is taking that to an even higher level of enhancement possibly in some focused way. Because I think the data collection is going to already be substantially improved and we're going to try to move it to another step. So, I think we can do that better, much better.

MR. ALBRITTON: So, Rich, what's your current thinking on getting something out versus developing that, because you raised the point?

MR. SCHEFFE: Again, I raised that point in the interest to provide more focus and less confusion in the beginning. The other part too, we've spent a lot of effort in trying to bring together a lot of experts and that's what you people are here. So, I would not hesitate to take a stab at printing out some thoughts. This is a good group.

MR. ALBRITTON: Jim?

MR. MEAGHER: I was going to suggest maybe

a compromise. That is, instead of describing a network or a set of cities to be studied, we would describe the siting criteria that we used in selection. For instance, if you want to look at gradients in concentrations, for example, we would select these kind of data and describe the kind of characteristic that the network would have. Maybe that's the intermediate, it's enough to help focus our discussion so it's not all over the place, but it's not quite saying, well, we've already decided to do Baltimore. We can agree or disagree about that later. So, maybe we can craft it in a way that gives enough guidance to focus what we want without stifling what kind of input we might receive.

MR. ALBRITTON: I forget who made the point, but I think too, when we see what comes back in, I think we will be able to address this a little bit better.

MR. VANDENBERG: I think one consideration we need to be aware of here is that part of the reason to go to the July meeting is to make sure that the broader scientific community, folks who are not invited today, are fully aware of all the thoughts and plans that are going forward. I would hate to have us have something in reserve that we're going to pull out, that we all know about, that others don't find out about until that meeting. So, as we develop things, I think we should really make an effort to make them available at the appropriate time, but not to hold anything back. Because otherwise we're...

MR. ALBRITTON: That favors something in the way of a draft that goes out before the meeting, that clearly identifies or signals that we're going to expect this to be drastically improved or whatever.

MR. GREENBAUM: Well, maybe that, we're going to have the pieces that people do, those are going to go out and there's something we do as a cover to that, to try to put this inside that, and we put it out there as, with all the appropriate comment, but it's detailed enough so that people begin to get a concept of what we're talking about. I think...

MR. FELDMAN: Sure, but I wouldn't discuss that until after the breakouts. I'd let people feel like they're having an opportunity to comment on the sections, before they go over the whole, before the whole thing comes back together again.

MR. GREENBAUM: Well, that's all. I mean, I think what we're doing is just saying, you've got this, this is where it came from, maybe reiterate, but not discuss it and summarize it and then send people to the breakouts, to go over the details of it. I agree.

MR. NEAS: I'd be more upset coming back from a breakout than before a breakout to hear John's plan. Because if I hear John's plan before the breakout, well, I'm going to take care of that. Then I'd come up with a plan and then John presents his plan, well, what did I spend the last six hours doing?

MR. GREENBAUM: We're talking about having a plan, something that's sent out...it's sent out to people that they can look at and see, we note it at the opening of the meeting that this was a first cut. We want to send you into the breakouts to really give us detailed feedback on this and then we're going to talk about tomorrow where we go next with it. I think that's...

MR. SCHEFFE: That's exactly.

MR. GREENBAUM: How much of a plan that is

and how detailed it is, we'll have to make a judgment based on what we get back.

MR. BACHMANN: I think, I have to say, we've asked a lot of you, and I think that as this thing has evolved, we've gotten, I think the discussion today helped me to try to figure out the separation between this sort of particular pot of money we have over here, how do we intersect that with an ambitious but logical array of things that meets the 10 priorities the Academy laid out. It clearly contributes, can contribute, but it can't do everything and it's not going to do everything. So, we have to make clear that what we're asking people to address here is not limited to this original thing we call super sites, but is much broader, ultimately affects the long term research plan that EPA and for that matter the other agencies that will be represented there, are going to be involved with. I think that's an evolution here in the discussion, as people started saying, let's look at this as five regional things.

MR. SCHEFFE: One other sort of little, John has opened up a little bit, general theme that wasn't covered. Part of the reason the term super site came up is, we're quite serious about moving towards this whole one atmosphere approach and not compartmentalizing into different pollutants. So, when we, the term super site is also somewhat associated with taking a much larger holistic look at all air quality issues, including oxidants, chronic deposition issues, you name it. So, that's another part and that theme didn't come across well in this meeting. I just want to throw that out, and that's something in our view is part of super, part of this program.

MR. CLINE: Just as an observer, from a goals

point of view, it would seem unlikely that a group as large as this is going to be, and as diverse that it's going to be, would excessively successful and really come out with something that presents this, but I do think it's worth making sure that we not only work it out, but that everybody understands that what we're really looking for from all of these breakout groups is a good gathering in of everybody's ideas, identifying where they're together and where they're not, but making sure, for their protection as well as ours, if this group came out effectively drafting a statement of work, then there'd be some concerns about conflict of interest...

MR. ALBRITTON: I would not have any hope that there would be a...

MR. CLINE: I think you ought to make it clear from the beginning that we don't want that, or people are going to get uncomfortable.

MR. GREENBAUM: We will make it clear. I will say actually, and I saw this at the earlier workshop last fall, that at least in the exposure group, actually the tendency was to go to fairly specifically starting to get down and do some drafting. So, it's not an unreasonable thing to sort of say what our expectations are. But I would guess with the large number of people and diversity of opinions, that we would have little or no hope of having a consensus. It could come close to being as specific as a set of specs or something, but on the other hand I think we should be able to get some guidance, and the idea is to be translated back into a report.

MR. ALBRITTON: The final product is a write up with some good informative appendices. But it is, it needs to be in my opinion, specific so that it's useful. It does not have to be a

consensus. You can actually achieve both goals.

MR. CLINE: And we're really talking to two groups. We're talking to a group of people who are there who will really probably be doing it, but we're also talking to the people who weren't there, we're talking with contracting officers and stuff like that who might come back at us at some time in the future and talk about what they think we were trying to accomplish. I think they need to be addressed as well.

MR. GREENBAUM: Well, Dan will be fully prepared for that.

MR. ALBRITTON: Funny, I had written down on a note, I was going to give it to you after the meeting.

MS. SHELDON: The issue with the straw man and maybe it's just that now this is dawning on me. Is this issue, it's all very well and good to want to generate all this data, the data that will be useful to exposure and useful to epi and useful to source apportionment, but who's actually going to use it? Unless during these straw men, the plan for the collection is very well integrated into the Academy's PM plan, in fact it may not be used. I say this especially, yeah, from the exposure viewpoint, the Academy has said that we need to get our exposure data in the first three years. I mean we may have in fact finished many or most of the studies before this is in place. I'm just afraid of, you know, the data is generated, yes, it can be extraordinarily useful in these, especially in long term epi, but I think that that integration into it is going to have to be key, if it is really ever going to be used. I think that that planning needs to be started here.

MR. ALBRITTON: I fully agree. Just a couple

of comments on that. One is the Academy context or framework with the involvement of the ones we have here, that were involved with a part of that study, we have almost automatic co-planning, to some extent, on that thinking. The second point is, if you build it, they will come. If there's...

MS. SHELDON: We hope.

MR. ALBRITTON: The key is that good data attract good ideas, in terms of analysis and so on. The limitation in the past has not been that nobody was ever interested in good data, it was in the support of follow up analyses by the agencies. That we've made, we've underscored the fact that that was a handicap in the past. We're hoping to fix that in the future with the agencies being more attuned to that kind of thing. Jon?

MR. SAMET: It might be useful if this were a part of the official presentation in June. Understanding it's evolutionary, but to make sure that...

MR. VANDENBERG: Well, we're developing the agenda for that, which I'm not sure if you've seen the draft or not. We had planned several presentations from EPA and then during the afternoon was post-jurors actually talking to investigators. Part of that was Rich and I are going to be presenting sort of the overall framework for the research, and Rich will be talking about the monitoring to include this aspect of it too. So, it will be presented there.

MR. ALBRITTON: Thanks, that's a good point. Putting it on the agenda for that meeting.

MR. SCHEFFE: Part of, this doesn't fully answer your concern, Linda, but part of what we plan to do

administratively with the program is set aside a significant chunk of the resources for analysis and interpretation of all the information coming out of there. So, that helps somewhat towards forcing the use of those data anyway.

MR. ALBRITTON: It was the comment we made this morning about having that planning up front and hardwired into the plan. You've said it's there, so that's encouraging.

MR. DEMARJIAN: There's one other thing, I guess. We talked a little bit this morning about the fact that we hope that these super sites will eventually be a bench mark to take care of some of the technologies, that that would be part of the operational network. Is the idea that that would get discussed under the source-receptor component? Right now it looks like it's going to slip through the cracks...

MR. ALBRITTON: Glen?

MR. CASS: To the extent that I have any predisposition to what I would want to put into that thing, I think some of the speciation type monitors co-located alongside whatever fancier set-ups we had. That will provide some immediate cross-comparisons.

MR. DEMERJIAN: I think one of the issues I'm concerned about is the, just the mass only FRMs, but the whole question of, and I understand the rationale for why it was done this way, but the whole question of what temperature and humidity effects have on that measurement, relative to other measurements that might be more atmospheric specific. It seems to me it's going to be very important, if down the road, some of the epidemiology data starts to get more specific and starts to not link directly just in terms of

mass, but finds out that the amount of water content has nothing to do with the problem, or they may find out it's a very important part of the problem. Either way, you don't have a handle on that.

MS. HERING: Well, the mass is defined without the watering. They measure it sort of dry. They collect it wet, they do measure it sort of dry, try and get rid of most of the water.

MR. ALBRITTON: That's sort of an operational research comparison, we need to be careful using that.

MR. SCHLESINGER: I wonder if those two issues, those two sidebar issues deserve to have a separate write up, because I'm a little concerned that they get wrapped up with some of those other issues as well.

MR. GREENBAUM: It might be worth it even if you had to repeat some of the things that were in the write-outs, just to make sure that they understand that they're...

MR. ALBRITTON: Well, why don't we plan to try to generate that, because we've had documents, we've had studies, discussions on it and the problem here is not that we don't know to do it, the problem is we don't ever get around to doing it.

MR. SCHLESINGER: That's my point. I think in order to get some emphasis put on, especially the epi, both of these issues, that they deserve some separate mention in this report.

MR. ALBRITTON: Yes, and they ought to be able to... Any other comments? Dan, would you like to close?

MR. GREENBAUM: Sure. Well, thank you for those of you, particularly for those of you who stayed through until the end of this. I think we all learned a little bit in the process of

talking about what we were doing and also how to have this conversation. I think we came up with some good ideas for what we can do at the workshop. We appreciate that, and I thank EPRI again for providing the luncheon and for organizing things, having organized this and provided the support. I think we were able to get a lot accomplished today and we'll hopefully get a lot more accomplished.

MR. SCHEFFE: Well, we certainly appreciate everybody coming here. We'll see what happens.

(**WHEREUPON**, the Conference was concluded at 4:27 p.m.)