TRANSCRIPT OF PROCEEDINGS

IN THE MATTER OF:)
)
DIESEL EXHAUST HEALTH)
EFFECTS PARTNERSHIP MEETING)

Pages: 1 through 149

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BEFORE THE U.S. DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

IN THE MATTER OF:	)
	)
DIESEL EXHAUST HEALTH	)
EFFECTS PARTNERSHIP MEETING	)

Room 225, Building 2
765 Technology Drive
Triadelphia, West Virginia

Tuesday,
September 19, 2017

The parties convened, pursuant to the notice, at 1:30 p.m.

PARTICIPANTS:

SHEILA McCONNELL, Director, Office of Standards, Regulations and Variances, Mine Safety and Health, Department of Labor

JIM ANGEL, Mechanical Engineer, Technical Support, Department of Labor

PATRICIA SILVEY, Deputy Assistant Secretary, Office of Operations, Mine Safety and Health, Department of Labor

WAYNE PALMER, Acting Assistant Secretary, Mine Safety and Health, Department of Labor

DR. JESSICA KOGEL, Associate Director of Mining, National Institute for Occupational Safety and Health

ROSLYN FONTAINE, Deputy Director, Office of Standards, Regulations and Variances, Mine Safety and Health, Department of Labor

PARTICIPANTS: (Cont'd.)

JEFFREY MONINGER, Mechanical Safety Division; Approval and Certification Center, Mine Safety and Health, Department of Labor

ALEKSANDER BUGARSKI, National Institute for Occupational Safety and Health, Pittsburgh Mining Research Division

LINK BOWERS, Technical Support
Mine Safety and Health, Department of Labor

MR. RAYMER (via webinar)

GREG MEIKLE, Chief of Health, Coal Mine Safety and Health, Mine Safety and Health, Department of Labor

JOE BETAR, Owner, Classic Motors, Chrysler Corp.

GEORGE SASEEN, Diesel Particulate Matter, Mine Safety and Health, Department of Labor

MONIQUE SPRUILL, Chief of Health, Metal/Non-Metal Division, Mine Safety and Health, Department of Labor

DR. RJ MATETIC, Director, Pittsburgh Mining Research Division, Mine Safety and Health, Department of Labor

MARK ELLIS, President, Industrial Minerals Association-North America

EVELYNN STIRLING, Cummins Engine Company

LARRY PATTS, Physical Scientist, National Institute for Occupational Safety and Health

EDWARD GREEN, Senior Counsel, Crowell & Moring, LLP

DAVE NARDO, Frontier Mining Ltd.

JOSEPH SBAFFONI, Mining Industry Consultant
JAS Mine Consulting, LLC

P R O C E E D I N G S

(1:30 p.m.)

MS. McCONNELL: Good afternoon. Hello, Arlington. Good afternoon, everyone. We are starting our second portion of today's event, which is our MSHA/NIOSH Diesel Partnership Meeting. This is our second meeting. And before we start on today's presentations, as you know, we have several folks in Arlington who want to join us, and they will be kicking off our meeting. And so, without further ado, I would like to introduce Patricia W. Silvey.

MALE VOICE: I don't think they're getting through.

MS. McCONNELL: I don't think they hear me.

(Laughter.)

MR. ANGEL: This is Triadelphia. Are we ready to get started?

MS. McCONNELL: Pat, can you hear us?

MALE VOICE: Yeah. We're going to start in just a minute.

MS. SILVEY: Did he say just a minute?

MALE VOICE: Yes.

MALE VOICE: Here's Aubrey.

FEMALE VOICE: I'm right here.

MALE VOICE: Okay. We're going to start in

about two minutes.

MS. SILVEY: Okay.

MS. McCONNELL: No, start now. Pat, can you hear us?

MS. SILVEY: I can hear you.

MS. McCONNELL: Yeah, but Arlington can't hear us.

MR. ANGEL: Can Arlington hear us?

MALE VOICE: Yeah, we can hear you.

MS. SILVEY: Okay. We're going to start in one minute, so please bear with us.

FEMALE VOICE: No problem. Let me know when you're ready and I will connect your lines.

MS. SILVEY: Thank you.

(Pause.)

MS. SILVEY: Okay.

FEMALE VOICE: Are you ready to begin?

MS. SILVEY: I'm ready to begin. Thank you.

FEMALE VOICE: I will join your lines in now and you may begin.

MS. SILVEY: Thank you. Let me first say good afternoon to everybody. I suppose we have people in a variety of locations. So rather than call off all -- well, it's not that many that I can't call them all off. Unfortunately, there are some of us in

Arlington who were not able to be in Triadelphia, West Virginia, today. And then we have people in Beckley, Birmingham, Denver, Duluth, and Vacaville.

So I want to thank all of you for joining us today. And so that everybody will get everything that's done today, we will have a record made of these proceedings. And we have --

(Audio reverberation.)

MS. SILVEY: So while everybody's speaking, I guess, people who are not muting their phones. I don't know what that was unless that was people coming online.

But anyway, this is a continuation of the MSHA/NIOSH Partnership. Now, on my notes, it says MSHA/NIOSH Partnership, but it's really MSHA, NIOSH, the industry, and labor all rolled up in a partnership. And this initiative started on June 6, 2016, when we published a Request for Information.

We held the comment period open until January 2018, as you all know. And one of the things that we continuously heard -- well, one of the things we heard, I think, was that we would hold an open-ended comment period, and so you will all be allowed ample time to have input into this partnership. This is the second meeting of the partnership. If I

recall, our first meeting was in December.

And at today's meeting, you will be provided the results of the comments so far, because we have gotten comments from a number of the participants in the partnership. We will also -- one of the things that I see as coming out -- I don't know where this partnership is going relative to rulemaking, and if some of you know, you have a better crystal ball than I do.

But one of the things I know that we promised each other was that we would share information. We would share information on best practices, on strategies, and I think innovations with respect to control in diesel exhaust, and if we come out with anything, that will be good, that if one partner has innovations and another partner -- if that person's organization can make it available to another partner, then those are the kind of things we want to make sure that come out of this partnership, best practices and strategies, and we can also post those kinds of things on our website, as well as NIOSH's website, and people can send their best practices to us.

Before I start, I want to introduce our new, and some of you have met him and some of you have

heard me introduce him before, our political deputy here at MSHA. He was former Chief of Staff to Secretary Acosta, Wayne D. Palmer, and he's going to say a few words, but after I mention one more thing. And I know that there are some of you in this room who are interested in MSHA's Examinations of Working Places proposed rule, as well as final rule.

As you know, on that Examinations of Working Places, Metal/non-metal final rule, we published it on January 23, 2017, and the effective date -- the proposed effective date was going to be May 2, 2017. When I say published it, I mean we published it in the *Federal Register*. And so we delayed the effective date for one time, and on September 12, again, we delayed the effective date, this time until March 2, 2018.

So we published two proposed rules on this same date, September 12, 2017. One would delay the effective date of the January 23 rule until March 2, 2018. And we are asking for comments on that and we have a quick turn-around time on those comments. The second proposed rule proposed several changes to the January 23rd rule. So, if you all follow me, and I think you do, the first change we did, as some of you know who follow this rulemaking, the January 23rd rule

required that a work in place examination be done before work begins in that working place.

The September 12th proposal changed that from before work begins until -- to be before work begins or as work begins, which means the substance is that near the beginning of the work in that place, the operator would do the workplace examination. So there are two alternatives: before work begins or as work begins.

The second proposal, for hazards that are immediately corrected, the proposal would provide that those hazards, you do not -- the operator does not need to make a record of hazards that are immediately corrected. If the hazard is not immediately corrected, in the January 23rd rule, the operator would have to make a record of the hazards. So those changes, we believe that those changes provided some additional flexibility for metal/non-metal operators as they manage their safety and health programs but also assure protections to miners, safe and health protections for miners.

We will hold four public hearings, and, if I'm not mistaken, one is in -- one is here in Arlington, one is in Salt Lake City, one in Birmingham, and one in Pittsburgh maybe. Somebody

correct me if I'm wrong. Pittsburgh. So nobody said anything, so I guess it was right.

Anyway, all the information on the metal/non-metal proposed rulemaking will be on our website. And as usual, we appreciate your participation in this rulemaking. And we encourage you to participate both in writing, as well as to participate on record at one of the four public hearings I just named.

And so one final thing before I ask Mr. Palmer to say whatever he has to say. One final thing is one of the things we promised you when we published the proposed, the January 23rd proposal, and I made the promise to you, and that promise was that we would -- and I'm talking to the metal/non-metal constituency who is interested in the metal/non-metal examination rule. We promised you that we would have outreach seminars, we would have training, and we would have training for our inspectors, and we will keep our promise. So before that rule goes into effect, again, I promise you that we are going to do those things.

And with that, I think those are the introductory remarks that I have, and, obviously, we're going to have several more hours for give and take with you all. So Mr. Palmer.

MR. PALMER: Thank you very much, Pat. I

just wanted to take a little time to briefly introduce myself. As I've been working with Pat since Inauguration Day when I was sworn in as the head of what they call the beachhead team, the team that landed and basically established the new administration of the President at Department of Labor.

But then I became interim Chief of Staff about three months later, until about three weeks ago when I came over to MSHA as part of a model of vision that Secretary Acosta has for not just MSHA but OSHA, EBSA, and some of the other agencies within DOL to nominate as assistant secretary of, again, an agency, someone with deep expertise in the regulated industries and then at least where that nominee perhaps has a lot of experience in Washington to appoint as deputy assistant secretary, more of a D.C. navigator, and that's where I came into the picture.

What that means in the immediate future is that I'm what they call the confirmation sherpa, the person who's responsible for helping shepherd the nominee through Senate confirmation. I'm actually between meetings in the Senate right now. And I'm pleased to report that the nomination is moving forward. It's advancing, actually, fairly rapidly, at

least by Senate standards. I anticipate that the nominee will get through the Health Committee, the committee of jurisdiction, probably sometime around the third, perhaps the fourth week of October.

And then, if he does get passed by the committee, he'll be put on what's called the executive calendar, where he would then be eligible to be called up and considered by the full Senate. When ultimate confirmation might come is a little harder to forecast, but really getting the nominee onto that executive calendar is more than half the battle. So I'm feeling pretty good about that process.

And, again, after I recuse myself here, I'm going to head back to the Senate for some more meetings with the nominee and Senators. Longer term, I want to be as visible and engaged as possible with all of you. I apologize that I'm not there in person. That was my hope that I could be, and were it not for this confirmation process, I would be.

I'm someone who learns by seeing and doing. And I'm not someone who likes to just sit in an office somewhere and type at my computer. I'd rather be out and about and meeting people and learning firsthand. So, with that, I'll say that I do look forward to meeting those of you I haven't already met.

And I think, once the nominee gets on that calendar through the committee, that's when I'll be able to dial back my efforts. At that point, it becomes a matter of the Senate majority leader finding the means and the opportunity to get our nominee and some others through the process. So, unfortunately, I have to run back to the Senate. Thank you for allowing me at least a couple minutes just to say hello. And I do look forward to meeting all of you in the future. Thank you.

MS. SILVEY: Okay. So I think next then we will just -- this does make it a little more difficult. Thank you, Wayne. This does make it a little more difficult. But we are going to follow our regular schedule, and I think next we will hear from our partner, one of our partners, and that's Jessica Kogel. Jessica, I assume you are in Triadelphia.

DR. KOGEL: Yes, I am, Pat, and I hope you can hear me. Can they hear me?

MR. ANGEL: Let's try. Try it again now.

DR. KOGEL: All right. Now can you hear me, Pat?

(Audio reverberation.)

MR. ANGEL: Okay. Sorry about that. It's Triadelphia. Can you hear us now?

DR. KOGEL: Can she see me?

MR. ANGEL: Okay. We're in Triadelphia. Can you hear us now?

MS. SILVEY: Yes, we can hear you.

DR. KOGEL: Okay.

MR. ANGEL: Okay.

DR. KOGEL: All right. Thank you, Pat, for the introduction. So, for those of you who don't know me, I'm Jessica Kogel. I'm the Associate Director for Mining at NIOSH. And I really, you know, in the interest of time and moving into our program, I'm going to make two kinds of brief comments that I would like you to, you know, consider as we move through today's proceedings. And, you know, one of them Pat already brought up, and that's the fact that this is a partnership that is more than just MSHA and NIOSH, and it's very important for everybody who's in the room representing all of our various stakeholders to have input, and this is really the forum for doing that.

And as she alluded to, this is a partnership that was established a little bit less than a year ago. This is our second meeting, and it's built on a model of partnerships that NIOSH has had for a number of years. And through our partnership experiences, we've learned that it's a really great forum for

bringing together all of our stakeholders and exchanging information and giving you all an opportunity to provide feedback to us. And that's something that comes into really informing our research and how our research goes forward.

Can everybody hear me okay in back of the room? Yeah? Okay. Good. And I don't know about out there, but hopefully.

So anyway, one of the things that's very different about this partnership and it's actually something I'm personally very excited about is the fact that it is co-chaired by MSHA and NIOSH. And this is the first time we've done this, and that was done strategically. That wasn't something that we did by accident. And what it does is it really reflects the commitment that our two agencies have for promoting and advancing mine worker health and safety.

Each of us, you know, has a different role in this process. NIOSH is really involved in and very much focused on the research piece of it, whereas MSHA plays much more in that regulatory space. And as two different federal agencies that have a common mission and goal, you know, we've realized that in order for us to be successful and to really advance that mission and help mine workers, we need to work together. We

shouldn't be working in a siloed kind of way.

So this partnership kind of gives us an opportunity to work in a way where both the research and the rulemaking process are being done with some kind of communication between them and so that the rulemaking can then be informed by the research and vice versa so that we're, again, not into these kind of different siloed places.

So this is in a sense an experiment and it's an exciting time. This is here for all of the partners at the table much more than just MSHA and NIOSH. So, with that in mind, as we go through today's presentations and we present our information both from MSHA and NIOSH, we're going to have opportunities for dialogue and for interaction and we really want to get that dialogue back. That's the first point.

The second point is, is I think it's really important for this partnership and any of the partnerships that we have is we need to be self-reflective, and what I mean by that is that when we established this partnership, it was a different time. It was a different administration. We have a new assistant secretary coming in for MSHA. Things change with research as we learn more. And so we have to

always come back to the table and ask ourselves a question, and that question should be, is this partnership as it was originally established still going in the direction that we need it to for everybody who's a member of that partnership.

And so, when we come to the end of this, RJ Matetic from NIOSH is going to be handling and moderating a closing discussion, and I think during that time, it's going to be very important for us to ask ourselves the question, is this partnership heading in the direction that we need it to to be of the most value for all of the partners. And I think probably at the end of every time we have a partnership meeting it's really good for us to go back and look at that.

So, again, on behalf of NIOSH, I want to welcome everybody here. I want to welcome everybody who's not here. And I'm really glad we could have this broad participation. And hopefully we'll be able to work through all of the technical challenges to connect each other virtually. So anyway, with that, we'll go ahead and turn it over, I guess. Do you want me just to -- I don't know where Sheila is. I can go ahead and introduce the first speaker, I guess. So there you are. Roslyn Fontaine is going to do a

discussion on responses to the MSHA Request for Information.

MS. FONTAINE: Good afternoon. My name is Roslyn Fontaine and I am the Deputy Director of MSHA's Office of Standards, Regulations, and Variances. As Ms. Silvey stated, we have a court reporter for this meeting, so I'm asking if you speak, please state and spell your name for the court reporter.

The RFI was published in June of 2016, and, of course, since then, the President has issued two Executive Orders. In Executive Order 13771, Reducing Regulation and Controlling Regulatory Costs, Section 2-A requires MSHA to identify at least two existing regulations to be repealed before we publicly propose for notice and comment or otherwise promulgate a new regulation.

In Executive Order 13777, Enforcing the Regulatory Reform Agenda, Section 3-A directs MSHA to seek comments on its recommendations to repeal, replace, or modify existing regulations from the public and entities significantly affected by *Federal* regulations, including state, local, and tribal governments, small businesses, consumers, non-governmental organizations and trade associations.

MSHA is informing our stakeholders that the

agency is seeking stakeholder input on its regulatory reform initiative during forums such as these, partnership and alliance meetings, quarterly training and stakeholder calls, walks and talks, and conferences. Information provided by stakeholders will help improve the health and safety of miners and assist MSHA in determining the appropriate regulatory action. Further information is forthcoming on where to submit comments and things of that nature.

During this process, we will be focusing our attention on best practices for controlling exposure to DPM. So today, we will be discussing Topic A: non-permissible, light-duty, diesel-powered equipment in underground coal mines to the extent that DPM emissions can be lowered by equipping of machines with a DPM filter or exhaust after-treatment systems. We will be talking about C, exhaust after-treatment in engine technologies, and E, metal/non-metal miners' personal exposure limits.

We will not be focusing on the advantages and disadvantages and costs associated with requiring all non-permissible, light-duty, diesel-powered equipment used in underground coal mines to meet current EPA emission standards. We will not be discussing maintenance of diesel-powered equipment in

underground coal mines and recordkeeping requirements. And we won't be discussing alternative surrogates to TC to estimate a miner's DPM exposure.

Okay. So we've got a few general comments on non-permissible, light-duty, diesel-powered equipment in underground coal mines. One commenter stated that MSHA's existing standards for light-duty equipment are out of date, specifically, 30 CFR 72.502. The commenter further remarked that current diesel engine technology can reduce DPM emissions beyond what the existing standards require and that all non-road diesel engines produced today are required to meet EPA Tier 4 standards.

A second commenter recommended that MSHA update 30 CFR Part 7, subpart E, Diesel Engines Intended for Use in Underground Coal Mines, as promised in the preamble to the 2001 final rule for diesel particulate. MSHA also indicated in the 2001 rule that it would adopt a more streamlined approach and rely heavily on the EPA's approval program for engines used in off-road applications. This second commenter also submitted a study on the contribution of light-duty vehicles to underground DPM exposures. And all of the studies are posted on our website.

Okay. So the first question. Is there

evidence that non-permissible, light-duty, diesel-powered equipment currently being operated in underground mines emit 2.5 grams per hour of DPM or less? A commenter stated that the national diesel inventory shows approximately 3400 pieces of light-duty equipment with only about 90, with engines listed as emitting less than 2.5 grams per hour standard. These commenters remarked that all light-duty equipment in Pennsylvania, West Virginia, and Ohio emit less than 2.5 grams per hour by state law, not by MSHA regulation, and to limit a diesel engine to 2.5 grams per hour is not a standard. It allows lower horse-powered engines to emit more DPM than higher horse-powered engines.

A second commenter said sort of the same thing, that MSHA's 2.5 grams per hour DPM standard is not a viable standard for comparison because it does not take into account horsepower. And as horsepower increases, so does the DPM concentrations. Tier 4 engines and most engines approved by MSHA for use in light-duty equipment can meet a 2.5 grams per hour standard if a DPM filter is installed.

A third commenter remarked that there is evidence that some equipment being operated in underground mines emits 2.5 grams per hour of DPM or

less. But the evidence is mixed and not formally published. Commenter further stated that the national diesel inventory data indicate that at least 97 percent of permissible and 90 percent of non-permissible, heavy-duty, equipment emit less than 2.5 grams per hour of DPM and that at least 50 percent of non-permissible, light-duty equipment, including generators and compressors, emit more than 5 grams per hour of DPM.

A fourth commenter, who happens to be a dealer for light-duty, non-permissible mantrips sold under two different brand names, stated that none of the mantrips currently manufactured by that company emit less than 2.5 grams per hour of DPM as delivered. Okay?

The second question deals with what administrative, engineering, and technological challenges would the coal mining industry face in meeting a 2.5 grams per hour DPM emissions level for non-permissible, light-duty, diesel-powered equipment.

Two commenters stated that the equipment in Pennsylvania, West Virginia, and Ohio have been built with an exhaust after-treatment system built by the original equipment manufacturer and there have been no

problems retrofitting after-treatment systems into the equipment, and there should be no problem doing so in other states.

Another commenter remarked adding DPM filters or purchasing in Tier 4 engines is feasible for the mining industry and all light-duty machines can be equipped with a DPM filter. Another commenter noted, however, that low DPM emissions were achieved primarily by the retrofit type diesel particulate filters and by filtration systems with disposable filter elements. Exhaust after-treatment could be an option for vehicles that have enough space for installation of such a system. The commenter further stated that replacement of existing engines with same-sized engines that meet EPA Tier 4 final standards is one alternative solution and cited studies discussing the challenges. And, again, the studies have been posted. A fifth commenter stated that aftermarket DPM filters would be needed to bring emissions below 2.5 grams per hour on his mantrips.

Okay. The next question deals with the cost of requiring the coal mining industry to lower all non-permissible, light-duty, diesel-powered equipment to meet the 2.5 grams per hour of DPM. So since that would deal with rulemaking, we're not going address

that today.

So I'm going to move on to what percentage of non-permissible, light-duty, diesel-powered equipment operated underground does not meet the current EPA emission standards. The first commenter said that we already have this information, which is true, and we will be making a presentation on that later.

The other commenter said currently, only engines in six out of 3,411 non-permissible, light-duty, diesel-powered equipment meet EPA Tier 4 final standards, and 99.8 percent of engines in the non-permissible, light-duty, diesel-powered equipment do not meet the current EPA emission standard. And we'll be talking about that later.

Okay. Question 5. What modifications could be applied to non-permissible, light-duty, diesel-powered equipment to meet current EPA emissions standards? What percentage of this equipment could not be modified to meet current EPA emission standards? If these are specific types of equipment, please list the manufacturers and model numbers.

Okay. One commenter stated that DPM filters are feasible controls that can be installed on all types of light-duty equipment and is currently being

installed on light-duty equipment in Pennsylvania, Ohio, and West Virginia. By adding a DPM filter to any light-duty machine, DPM concentrations will be reduced to levels equivalent to EPA's Tier 4 DPM standard.

A second commenter remarked that oxidation catalysts, DPM filters, and exhaust emissions control and conditioning systems could be applied to non-permissible light-duty equipment, and cited supporting studies. A third commenter said that modifications in order to meet EPA Tier 4 final emissions standards would involve retrofitting existing engines with advanced integrated exhaust after-treatment systems to control PM, NMHC, CO, NO_x emissions. The success of some retrofit programs is uncertain due to the technological challenges of integrating advanced exhaust after-treatment systems with existing engine systems.

Okay. Question 6 deals with advantages and disadvantages and costs associated with requiring all non-permissible, light-duty, diesel-powered equipment operating in underground coal mines to meet current EPA emission standards. Again, we won't be discussing that today.

Okay. The last question in this section

dealt with West Virginia, Pennsylvania, and Ohio limiting diesel equipment in the outby areas of underground coal mines based on the air quantity approved on the highest ventilation plate. What are the advantages, disadvantages, and costs if MSHA adopted such an approach? We only received two comments.

The first commenter stated that increasing ventilation name plates for machines, especially for DPM control on light-duty equipment operating in outby areas, is problematic. It is not feasible to monitor the air or even determine over a shift which air course a machine is operating. This commenter went on to say that since MSHA cannot measure concentrations of DPM in underground coal mines, increases in ventilation rates on a name plate for individual machines is not feasible, and as a result, miners' exposure to DPM cannot be evaluated to determine if an increase in ventilation is actually reducing DPM exposure.

The second commenter suggested that it would help ensure that DPM is being moved out of the mine atmosphere properly by not allowing too many machines to operate when there is not sufficient air in the area. And there are no disadvantages to this, other

than the operator not being able to have the flexibility to operate as many diesel machines as it would want on a single split of air.

That's all the comments we received on the first section. Does anybody have any questions or comments they'd like to make?

FEMALE VOICE: For those participating on the phone, if you would like to ask a question, please press star one and record your name. If you would like to withdraw your question, please press star two. Again, to ask a question, please press star one. It will take a few moments for questions to come through. Please stand by.

(Pause.)

FEMALE VOICE: We show no questions at this time.

MS. FONTAINE: Okay. Thank you.

Okay. So we will not be discussing Section B, Maintenance of Diesel Powered Equipment in Underground Coal Mines and Recordkeeping Requirements. We'll be moving on to Section C, Exhaust After-treatment and Engine Technologies. We received quite a few comments on this section. Okay. The first -- I'll just discuss the general comments we got overall.

One commenter stated that MSHA should re-evaluate the remaining types of light-duty equipment currently operating underground to determine if additional equipment should be included under section 72.501. For example, in the 2001 rule, MSHA required generators and compressors to meet the same DPM emission limits as heavy-duty equipment based on their contribution to miners' exposure to DPM.

A second commenter stated that MSHA must take into account the crucial role of the original equipment manufacturer in developing equipment suitable for use in a mine environment and that Tier 4 engine technology has not yet fully matured. The commenter went on to say that once enhanced engines and monitoring equipment become more readily available, mines will need adequate time to plan capital expenditures, evaluate equipment, and revise maintenance schedules and procurement contracts well in advance of any future compliance date. This commenter stated it is vital for MSHA to consider these practical challenges working in partnership with stakeholders in the context of the interagency approach.

A third commenter stated that in addition to producing lower emissions, Tier 4 engines require low

sulfur fuel and low ash oil, which will also improve air quality. This commenter stated that the increase in cost would be offset by improved motor performance.

A fourth commenter explained how diesel particulate filter performance is enhanced by using biodiesel fuel. The use of biodiesel with DPF can promote generation in the DPF systems because of underground mines' tendency to have a low balance point temperature. This can eliminate extra expenses related to DPFs and negate the need for active regeneration of the filters.

A fifth commenter described targeted improvements to reduce exposure for two high exposure groups, shotcreters and magazine keepers, and included a data table, which is also posted. Continuously regenerating trap DPFs fitted on shotcrete rigs achieved a 99 percent reduction in emissions. To reduce exposures to the magazine keeper, vehicles were rerouted away from the magazine.

This commenter noted that intrinsic safety is not a limiting factor in equipment implementation at metal/non-metal mines and they describe controls under development at a metal/non-metal mine, including using high-quality, low sulfur diesel fuel, engaging with suppliers to improve engine design and exhaust

treatment devices, just to name a few. Another commenter submitted spreadsheets, and we got like five reports that are also published on our website.

Okay. Question 14. What exhaust after-treatment technologies are currently used on diesel-powered equipment? What are the costs associated with requiring and maintaining these after-treatment technologies and by how much did they reduce DPM emissions? How durable and reliable are after-treatment technologies and how often should these technologies be replaced?

One commenter stated that MSHA's diesel inventory has up-to-date data on the manufacturers and model types for DPM filters and that we should make the information available to industry. And, again, we will be making a presentation on that.

A second commenter explained that there are both paper and ceramic-based filters. Ceramic filters can last thousands of hours. Paper filters are typically changed during the 100-hour maintenance of the equipment. Ceramic filters can reduce emissions by 90 to 95 percent but cost around $20,000 to install onto one piece of equipment.

A third commenter described having both paper filters and ceramic filters. The commenter

stated that it would cost approximately between $12,000 to $25,000 to retrofit one piece of existing equipment with a DPF system. This commenter recommended including an oxidation catalyst in all DPF after-treatment systems to greatly reduce the carbon monoxide concentration in the exhaust, and burn up approximately 20 to 30 percent of the organic carbon factor of DPM. This commenter stated that these are required by Pennsylvania, West Virginia, and Ohio, and are not very costly, do not require a lot of engineering to install and, if maintained properly, give a great return on your expenditure.

A fourth commenter reported that catalytic diesel particulate filters achieve around 60 percent removal efficiency, last approximately 5,000 hours, and show 70 to 80 percent durability during that time. Filter replacements can cost from $12,000 to $15,000 per unit and may involve lengthy downtime while a new filter is obtained and installed. This commenter stated that capturable filters have better removal efficiency, like 95 percent removal with costs of $30,000 per unit, replacement of internal parts running $14,000, and cleaning costs, $2,000.

A fifth commenter provided information on several strategies. Catalytic converters and

installed dry filter systems with a replacement cost of between $12,000 and $15,000 per unit and a removal efficiency of about 60 percent; catalytic or capturable diesel particulate filters, which cost $30,000 per unit, $15,000 for filter replacement, and provide 95 percent removal efficiency; diesel exhaust fluid, in addition to DPFs.

Loaders with filters that convert up to 90 percent of DPM to carbon dioxide in water. A suite of removable technologies, such as DPM filters and Urea injection or Sintered Metal Filters, which cost roughly $50,000 to purchase and install, $6,000 annually to maintain. Diesel filter elements, which cost $23,500 to install and $121,000 annually to maintain. Diesel oxidation catalysts, which cost $17,000 to install. The latter three technologies capture anywhere from 83 to 99 percent of DPM. So we got a lot of lists of different types of controls that can be used. Installation of DST scrubbers, let's just say it costs like $110,000 per engine.

A sixth commenter explained that those diesel exhaust filters that operate at high temperature, such as auto-regenerating ceramic filters, cannot be used on intrinsically safe equipment, a requirement for use in underground coal

mines. This commenter explained that their large vehicles are fitted with water traps and that DPM filters are installed after the water trap and must be low temperature and able to withstand the high humidity environment created by the water trap.

This commenter described a 50 percent exposure reduction with installation of washable filters. The company has since upgraded to fiberglass filters, having 90 to 100 percent efficiency, which are three times costlier but have a longer filter life, 50 hours instead of eight, reduced technician time, increased machine availability, and reduced disposal costs, offsetting the higher filter costs. This commenter also described back pressure monitoring used on larger vehicles to monitor filter loading, with filter changeout at 10 kPa pressure drop across the filter. A seventh commenter stated that MSHA should upgrade again Table 72-502.1. And another commenter submitted six studies.

Now we'll move on to Question 15. What are the advantages, disadvantages, and relative costs of using DPM filters capable of reducing DPM concentrations by at least 75 percent or by an average of 95 percent or to a level that does not exceed an average concentration of .12 milligrams per cubic

meter of air when diluted by 100 percent of the MSHA Part 7 approval ventilation rate for that diesel engine? How often do the filters need to be replaced?

One commenter stated that all commercially available DPM filters will reduce DPM with high efficiencies, which would meet Tier 4 engine standards, and that MSHA has the data on its diesel inventory to determine DPM filter efficiency with ventilation rates in order to calculate an exposure and that MSHA should provide the most up-to-date data from the inventory to industry, which we will be doing.

A second commenter stated that the cost of such systems are around $20,000 to install one of these systems onto one piece of equipment and that these systems can reduce emissions by around 90 to 95 percent. A third commenter stated that most available filters have either 60 percent or 95 percent removal efficiency. Ninety-five percent DPF have a much higher associated cost, coatings that produce increased NO_2 emissions, resulting in the need for additional controls, that are available only on engines at Tier 3 or higher and can create visibility issues as these filters have to be very large to capture the exhaust of older engines.

For 60 percent filters, operators have experienced duty cycle replacement at around 5,000 hours approximately every three years, although some have reported greater difficulties with Tier 3 equipment, resulting in replacement at around 2,000 hours. The 95 percent filters are fairly new and their replacement interval is not yet known. This commenter also described an instance where a powder truck required daily filter replacement. Filters were discontinued in that case.

A fourth commenter expressed concern regarding costs of 95 percent efficient filters, coatings that produced a greater amount of NO_2 than pure technologies and problems retrofitting them onto existing equipment. This commenter described filter replacement intervals of every 24 hours, every 4,500 hours, every nine to 10 months or never, with dry filter systems having less service down-time since the operators can change the filters themselves. This commenter proposed more cost-effective alternatives, such as additional ventilation and administrative controls.

A fifth commenter provided information on several issues, like the national coal diesel inventory shows that more than 370 heavy-duty

permissible packages include filtration systems with disposable filter elements. Over 1,140 non-permissible, heavy-duty, engines are retrofitted with diesel particulate filters or filtration systems with DFEs to meet MSHA Pennsylvania and West Virginia standards, and over 670 light-duty vehicles are equipped with DPFs or filtration systems with DFEs.

Most require additional ventilation to meet the 2.5 grams per hour standard or .12 milligrams per cubic meter standard, except for a few recently meet the 2.5 grams certified non-permissible engines with integrated DPM controls. Reducing DPM emissions to 120 micrograms per cubic meter would require additional air or a higher efficiency filter for most engines that currently need to meet the 2.5 grams per hour standard. The DFEs used in underground coal mining should meet more stringent standards.

One area that requires improvement is the efficiency of DFEs throughout their useful life. The current certification and verification procedures should be improved to accommodate the variety of deployed engines and exhaust after-treatment technologies, should detect potential secondary emissions of toxic substances, and assess both particulate mass and number concentrations. More

stringent standards are needed to ensure that in use emissions from diesel-powered vehicles remain close to certification levels and to verify in use performance of exhaust after-treatment technologies. Advances in portable emissions measurement systems allow for real-time monitoring of the currently regulated pollutants emitted by engines.

Okay. Question 16. What sensors, e.g. ammonia, nitrogen oxide, nitrogen dioxide, are built into the after-treatment devices used on the diesel-powered equipment? One commenter stated that carbon monoxide and temperature are the only sensors that come built into the after-treatment devices, although other sensors, such as nitrogen oxide and nitrogen dioxide, can be built into the system as additions to meet state law requirements.

A second commenter stated that equipment only has back pressure and temperature sensors built into the equipment, although some facilities also perform separate testing on equipment exhaust for specific contaminants. The commenter also stated that some engines with urea injection have a NO_x sensor.

A third commenter stated that after-treatment devices do not use ammonia, nitrogen oxide, or nitrogen dioxide sensors, although one facility

measures diesel exhaust for particulate matter, nitrogen oxide and other gases with some regularity.

A fourth commenter stated that modern Tier 4 engines have the sensors needed to make the after-treatment system work properly as installed by the engine manufacturer.

A fifth commenter described Continental Automotive NO_x sensors that can be used upstream and downstream of selective catalyst reduction systems to control urea dosing and diagnose SCR systems. This commenter also described Delphi ammonia sensors for vehicles with an SCR after-treatment system that can help optimize NO_x emissions.

Question 17. Are integrated engine and exhaust after-treatment systems used to control DPM and gaseous emissions in the mining industry? If so, please describe the costs associated with acquiring and maintaining integrated systems and the reduction in DPM emissions produced.

One commenter described the high costs of integrated engine and exhaust after-treatment systems. One mining company spent over $2.5 million replacing engines and dry filter systems, with a decrease of 95 percent per modified piece of equipment. This commenter concluded that these systems can work well

but are complex, costly, and require ongoing maintenance.

A second commenter described costs of around $20,000 and emission reduction from 75 to 95 percent. A third commenter stated that these systems are more complex, require additional maintenance expertise, and possess more operational steps than older equipment and, thus, impose higher costs, including labor costs. This commenter also described significant delays in delivery.

A fifth commenter described ventilation reduction retrofist for Caterpillar engines which incorporate selective engine hardware/software to minimize DPM in the engine exhaust, provide modern engine management systems to older engines, and are compatible with using exhaust filters and low sulfur fuel. This commenter stated that their loader fleet has been fitted with OEM DPFs in conjunction with a recent OEM ventilation reduction engine upgrade, which has reduced total emissions of their loader fleet by an average of 77 percent.

Okay. We won't be discussing Question 18, and we'll move to 19. In the mining industry, are operators replacing the engines on existing equipment with Tier 4i interim or Tier 4 engines? If so, please

specify the type of equipment, make and model and engine size and tier. Please indicate how much it costs to replace the engine, parts and labor.

Two commenters stated that engine replacement is often not feasible due to configuration differences, high costs, and lack of OEM engineering support. These commenters stated that mines often switch to Tier 4 engines only when the entire piece of equipment is replaced that increased lead time and costs are issues with Tier 4 equipment. These two commenters stated that in some cases, operators have had to accept new Tier 3 equipment as replacements, for example, on drilling and bolting equipment.

One of these commenters stated that purchasing or leasing equipment with Tier 4 engines as older equipment retires is often more cost-effective than engine replacement but can still be quite expensive and that one mine operator estimated that replacing its existing fleet of equipment will cost tens of millions of dollars. This commenter described a mine that upgraded its Wagner loader fleet, Eimco 913 LHD fleet, and replaced forklifts which contained Perkins engines with Gehl forklifts.

This commenter gave cost examples for installing Tier 4 engines on two existing pieces of

equipment of $72,000 and $40,000. This commenter stated that some Tier 4 engines are not supported by a dealer network in the company's area. This limits that company's choice of engines and its ability to source parts and technicians in its region.

A third commenter has a planned replacement schedule so that the majority of engines used in heavy equipment are Tier 3 and will be Tier 4 by 2020. For light vehicles, low emission V8 1VD engines are being purchased as replacements for one HZ engines. 1VD engine emissions are lower emissions than one HZ engines fitted with DPFs. However, no Tier 4 solution is in scope for light vehicles.

The third commenter requires that contractors' vehicles have an EPA rated Tier 4 engine or, if a Tier 4 solution is not available, an EPA Tier 3 engine retrofitted with Continuously Regenerative Trap style diesel particulate filters.

Okay. Question 20. What types of diesel equipment purchased new for use in the mining industry is powered by Tier 4i or Tier 4 engines? What types of diesel-powered equipment purchased used for use in the mining industry are powered by Tier 3, Tier 4i, or Tier 4 engines?

One commenter stated that much equipment is

gradually being replaced with Tier 4 equipment, with only a small portion replaced with Tier 4 to date. Equipment affected includes trucks, loaders, excavators, drills, bolters, and powder trucks, as well as smaller equipment, such as gaters, welders, and generators.

One commenter provided examples of equipment that can be powered by Tier 4i or Tier 4 engines: Wagner loaders, CAT haul trucks, some track drills, Bobcat forklifts and loaders. This commenter stated that trucks, loaders, excavators, highway truck-based units, drills, bolters, and powder trucks often have Tier 4 engines. However, new heavy equipment is not equipped with Tier 4 engines, so that the overwhelming majority of most company fleets are equipped with Tier 3 engines.

Okay. Question 21. Are Tier 4i or Tier 4 engines used in underground mining equipped with diesel particulate filter systems? (e.g. advanced diesel engines with integrated after-treatment systems).

One commenter described one mine operator having all its Tier 4 engines equipped with integrated systems, a second with all its equipment greater than 30 horsepower having DPF, a third with none of its

equipment having DPF systems, with other companies falling within this range. One commenter stated that many Tier 4 engines have integrated systems, but some operators meet emission requirements in other ways.

22. How long have Tier 4i or Tier 4 engines been in use in the mining industry and what additional cost is associated with maintaining equipment equipped with these engines?

One commenter stated that Tier 4 engines on heavy equipment in his industry have only been widely used in the past few years, while another stated that in his industry, adoption started as early as 2009 for one operator but that most did not start adopting Tier 4 engines until the past two years. This commenter stated that heavy equipment with Tier 4 engines started coming online on or around 2012. Two commenters stated that long-term service and maintenance costs are not yet clear in their industry but that the systems are complex and require highly trained technicians for service, which increases service and costs.

One of these commenters stated that the need for a CAT technician, combined with the system's complexity, led to an additional cost of 30K over a 2.5 year period for one piece of equipment with a

Tier 4 engine. Another suggested that increasing maintenance costs has been negligible. Two commenters noted that service calls on equipment with Tier 4i or Tier 4 engines are usually longer than on equipment with other older engine types and that they need to special order parts more frequently for these engines.

23. What percentage of underground coal mines' total diesel equipment inventory is equipped with Tier 4i or Tier 4 engines?

One commenter stated that in Pennsylvania, he or she was aware of no Tier 4 engines currently being used and that most of the fleet was made up of Tier 2 and Tier 3 engines. A second commenter stated that a minority of underground diesel equipment at their metal/non-metal operations is equipped with Tier 4i or Tier 4 engines.

A fourth commenter stated that, where possible, vehicles with older engine technology are retired. Just one Tier 1 engine loader remains in service. The majority are Tier 2, while the newer loaders have electronically controlled Tier 3 engines. Tier 4 engines presently do not meet the intrinsically safe regulatory requirements. The bulk of the diesel fleet are front-end loaders, with the majority powered by Caterpillar 3126 engines and a smaller number by

Caterpillar 3306 engines or the newer Caterpillar C-9 engines.

Additionally, there are a number of PJB and Drift runner personnel transport vehicles which use Perkins 1104, 1006 engines respectively.

Okay. Those are the comments on exhaust after-treatment and engine technologies. Does anyone have any questions or comments?

FEMALE VOICE: As a reminder, if you'd like to ask a question, please press star one.

(Pause.)

FEMALE VOICE: There are no questions from the phone lines.

MS. FONTAINE: Thank you.

Okay. We will not be discussing monitoring metal/non-metal mines' exposure to DPM or discussing alternate surrogates, other than TC to estimate a miner's DPM exposure. So we'll be moving on to the last category, E, metal/non-metal miners' personal exposure limit.

27. What existing controls were most effective in reducing exposure since 2006? Are these controls available and applicable to all metal/non-metal mines?

Based on MSHA's data, metal/non-metal

miners' average exposures are well below the existing standard of 160 micrograms per cubic meter.

28. What are the technological challenges and relative costs of reducing the DPM exposure limit? So we will be having a presentation on the best practices and controls that are in use and working in our metal/non-metal mines. So, with that, if there are no questions or comments, I'll be turning it over to Jeff Moninger.

MR. MONINGER: I don't know. Do we all want to take a quick five-minute break before Alex gets on his presentation? Great. So five minutes, I've got 2:35. At 2:40, we'll start back up.

(Whereupon, a brief recess was taken.)

MR. MONINGER: Okay. We about ready to get started again with Alex's presentation? Phone people, can you hear us again?

FEMALE VOICE: Yes, we can hear you.

MR. MONINGER: All right. Great. Thank you.

MR. BUGARSKI: Okay. You ready? My name is Aleksandar Bugarski and I'm with NIOSH PMRD. I'm going to look a little bit in what we are going to do to improve existing knowledge over, you know, how to

regulate and how to actually reduce emissions from diesel-powered equipment. You know, basically, we have no mandate for almost two decades. Ever since MSHA introduced regulations is to work on improving these visibility based regulations, and normally how we can do that is by advancing our knowledge and putting us ahead of the problem.

We are embarking onto new projects, actually, as of beginning of the next fiscal year. That means next month we are starting this new project which is going to have five specific aims. And we discussed quite a bit what we can as NIOSH do to address existing exposures and what we can do to advance our knowledge.

The first specific aim is related to development of evaluation technologies and strategies to prevent overexposures to DPM over critical affected occupations in underground metal/non-metal mines. What we have heard today pretty much and in the past is discussion, how are we going to reduce general levels and average levels. We want to look a little bit deeper and try to address some of these specific occupations because we have seen from MSHA data that, on average, industry is okay. But we are still seeing a relatively large number of overexposures.

And then specific aim two is actually going to evaluate in laboratory, in the fields and implement novel and emerging advanced engine technologies for heavy- and light-duty underground mining applications. That's exactly how long of this Tier 4 final engines and how we can get more advanced engines in underground mining industry.

Specific aim three is develop and elevate canopy air curtains for mobile underground mining equipment as a control strategy for diesel aerosols. And I'm going to talk little bit about that, but it's one way to address some specific occupations.

Develop and evaluate filtration and pressurization systems for environmental enclosures for mobile pieces of underground mining equipment as a control strategy, because we see now egress a lot of equipment these days have environmental enclosures and we want to work on existing and newly developed enclosures.

And then, of course, the last but not the least topic would be to develop and evaluate, in the laboratory and field, advanced disposable filter elements because we have observed that in a time, these disposable filter elements are around for many, many years and same models are still used. And we

would like to look in advancing that technology and getting better products on the market and also promoting already existing better products.

Before I start talking about the future, I would like to kind of reflect little bit on our past and we have a relatively long history of conducting diesel research at NIOSH PMRD. For past two decades, we did a lot of research based, all above-ground efforts to reduce exposure of underground miners to aerosols and gases emitted by diesel-powered equipment.

And we have been primarily focusing on development, evaluation, and implementation of advanced control strategies and technologies for underground mining applications specific to those. And then, of course, improvements in monitoring exposure to diesel aerosols. And then, of course, we did some of the underground fundamental research related to characterization of diesel aerosols because that's a dynamic entity, ever changing. So, with the new diesel technologies, we need to keep up doing that.

So we have wealth of findings. I'm not going to go through too much of that today. But what we focused on is diesel particulate filter systems.

We promote those for almost two decades, and I guess that technology's advancing and is getting better and better, but it's not universal way of dealing with DPM emissions in underground applications, so they have some downsides too.

Diesel oxidation catalytic converters, we looked into those issues. Particularly, there's some issues with NO_2, for example, because those which were good -- DFEs which are good for on-road applications might not always be good for the underground applications. We looked into those issues, how to address that and how to develop products which are suitable for underground mining industry.

Disposable filter elements, we evaluated those in several instances and we found there are good and better products. So, basically, we would like to see those better products out there.

And then, of course, we looked into environmental enclosures. We looked in say additives used in conjunction with DPFs in the specific way with SMF, sintered metal filters. And then, of course, we did quite a bit of research based on corn and soy bio-based farm biodiesel. That's a fatty acid metal ester biodiesel. Very popular as a control strategy in some underground non-metal and some metal mines.

And then, of course, we looked into advanced fuels like hydrotreated vegetable oil, renewable diesel, which is probably the ideal diesel fuel for all applications. And then, of course, a lot of stuff which we published in the past is related to trying to characterize diesel aerosols in underground mines with respect to the effects of all these control technologies, strategies, and also with, you know, changing with the development of diesel engine technology.

Evaluation of health effects and exposure, of course, that's the ultimate goal we have, of course, as engineers at PMRD. We can only support certain of these research topics. And we did that primarily working with our sister office down there in Morgantown with the Health Effects Institute, Health Laboratory Division, sorry.

Development of DPM monitoring technology, that's something what we still need to work on. We have NIOSH 5040 as a benchmark, which definitely is a little bit more artsy than we would like to be. And the other issue is we would like to eventually develop some real-time monitoring capabilities. So basically we have seen effect of PDM or CPDM had on exposures to dust, and having real-time instrument definitely would

assist industry in lowering current exposures.

And, of course, you know, we are trying to disseminate all the information to our constituents, and, you know, we are doing that through peer review journals and NIOSH RIs, Reports of Investigations. And, of course, we publish the book, you know, trying to summarize all our experiences. We held a number of the workshops, over 40 workshops over past two decades in United States, South Africa, and even Australia. So, basically, I think NIOSH diesel research has pretty good reputation around the world.

You know, somebody would say why you need to do more of this research and thanks to some, you know, developments and, of course, to dynamic nature of diesel emissions, we always have something to do. But the arguments are the following. You know, diesel is, as you know, very vitally used in underground mining industry, and we have still, you know, almost every miner in metal/non-metal and a number of those in the coal mining industry chained basically to the diesel piece of equipment. There's no movement around the mines. There's no work done without diesel. So, basically, it will remain as a major, you know, mule for the mining industry.

And then, of course, unfortunately, diesel

exposure to diesel aerosols and gases are linked to the various health outcomes. You know, most of us are talking about lung and, I mean, pulmonary effects, but there's cardiovascular, there's cognitive, there are, you know, all kinds of effects diesel can cause, and we need to continue working on it.

The other important aspect, which actually flew by, you know, in the years now is an announcement from International Agency for Research on Cancer, IARC, in 2012 that diesel is basically carcinogen and that kind of should have a much stronger, I would say, effect on how we're treating this problem because by that time, it was suspected carcinogen, but now we have confirmation that it's definitely carcinogen. As a carcinogen material, you know, just to remind those who are not industrial hygienists, we don't have really safe levels of being exposed to, so it needs a little bit different attention.

And then, of course, diesel engine technology is advancing very rapidly and we are living at the age where that dynamics of advancement is very, you know, accelerated. In a sense, we have seen more advancement in diesel technology in the past couple years than we had in previous decades, and reason for that is we have to actually tap on that and actually

benefit from that.

And then, of course, something what I need to remind you guys is that current regulations are visibility-based regulations. So, basically, if our technology is advancing, we can discuss issues like we discussed previously about can we lower the standard. Of course, if we have technology and if mining industry actually accepted technology and implemented, then we can talk about lowering, but that has to be accomplished basically.

Let me talk first about what actually made us think about these specifically targeting certain occupations. I looked through MSHA, I mean, thanks to you guys, we have some information on exposures of underground miners that's pretty hard to come by because, you know, even your database on the DPM is relatively, I would say, limited compared, for example, to dust sampling. Very few samples are collected. But you can still draw some general conclusions about the trends in the mining industry.

And for those of you who are not real familiar with the DPM sampling, three types of samples were collected in underground metal/non-metal mines and they are under Contaminant Code (CD) 560, 561, and 562. Two first codes are compliant samples. The one

on 562 is noncompliant samples, which is ambient sampling used to establish this ratio. We analyze all that data, and I think Monique also is going talk more about, you know, trends, but I'm going just to grab some aspects of that.

And then, you know, you have to understand that this is not random samples collected. This is something what, you know, inspectors do on their discretion. And then, typically, they're trying to target those which are the, you know, potentially expose the highest concentrations.

What bothers me to some extent is that we have all this information for metal/non-metal mines, but we don't have any information what all coal miners are exposed to. And I think that was written in a law basically, that we should not sample in the coal mines. Some hypothesis were introduced when regulations were introduced that controlling DPM emission at the source is going to help reducing exposures. But I still believe as a researcher that we should verify that.

There's very limited data available around the world, and probably one of the largest sets is now from northwestern Australia and a recently published paper by Peters, et al. So, basically, MSHA collects

about 50 -- 500 -- 460 to 560 samples a year. I looked through a period between 2012 and 2016. And, basically, on the left-hand side graph, it's showing basically spread of that data. When you do averaging, you know, and I think statistically it might not be kosher, but you can do averaging and you'll see that these trends are showing, as probably MSHA on the website is also showing, that we have this trend where TC and EC concentrations are continuously dropping ever since regulations were introduced. And dramatic drop occurred after 160 micrograms per meter cubed level was established.

On the right-hand side graph, you can see that averages for industry. And we are talking about averaging over 500 whatever samples were collected per year. And, you know, we're below 123 micrograms per meter cubed what is basically of EC, what is equivalent to 160 micrograms per meter cubed. So, basically, if you talk about motivation of a general industry, what we need to do more to be in compliance, they don't need to do much more. They're already there.

But there is something to consider that, you know, about 18 to 28 percent of 560, that mean elemental carbon samples, are exceeding concentrations

of 123 micrograms per meter cubed. That mean that in this period, as you can see on right-hand graph, we have pretty high concentration -- high percentages of, you know, these overexposures basically, all concentrations over 160 micrograms per meter cubed to be explicit.

You know, Monique is going to talk little bit in different terms all because about compliance about 160 EC, so numbers are going to be a little bit different. But even if you're talking about 10 or 15 percent or 20, 25 percent of accedence, we still have something to do about those people. And, you know, it's important to notice when you analyze this for occupation. You will find that certain occupations definitely are exposed more than the others, and the reason for that is, for example, when we looked for 2015 and 2016, we found, for example, that 30 percent in 2016 of all the samples on the blasters showed concentrations above 160 micrograms of elemental carbon.

That mean, you know, that's a pretty good chance that if you're blasted that you're overexposed. That's a broad -- it's not that bad for truck drivers and, you know, some other occupations, but where you have, you know, about 5 to 10 percent chance that

you'll be exposed. But for the blasters or some scalers and some other occupations, there's a pretty fat chance that you're overexposed.

So, in summary, you know, we have seen positive trends. You know, our exposures in underground mines since 2001 are dropping, and we can still, you know, be proud of the work we did to do that, and industry can be proud of achieving these goals. So although these averages of below PELs, relatively large fraction of the observed samples still indicate overexposures. Overexposures were more frequent for some occupations than for the others, and, therefore, it transpires that additional solutions specific to the operations and occupations are needed to protect all occupations.

So let's talk about how we are going to achieve this. An objective is to help industry to reduce DPM exposures of critically affected occupations. And we'll need to solicit participation from industry because, again, as NIOSH is a government, we have no really direct access to the workers. So we need to find willing partners in our industry which are going to help us to assess first what these people are exposed to.

And then, of course, we are hoping that

through these types of venues, including this partnership or MSHRAC or mining associations like NMA, IMA, or NSSGA, we can get access to these mines. And then, of course, we are doing some direct contacts with mining companies, which we worked with in the past and we are hoping to work with in the future.

And then we would go to a site like that to establish monitoring practice there, because, again, you know, MSHA is capable of collecting a limited number of the samples for a short period of times. We would like to expand to do real evaluation, statistically significant evaluation of exposure of certain specific occupations.

And then we will actually have to mount, basically, a study where we would bring sophisticated instrumentation and characterize aerosols and gases in that environment. So, basically, we can basically formulate our solutions. And then, basically, we will find or hopefully find solutions. We'll use an array of multi-faceted engineering and administrative workplace solutions. And we'll apply that, and eventually we have to re-evaluate the situation and see how effective those solutions are.

And then, of course, we are hoping that industry would benefit with these novel technologies

and workplace strategies and we'll be able to reduce exposures of these specific occupations, and we're talking about drill operators, front-end loaders, blasters, whoever we identify as highly exposed occupations. And as a usual way, we are going to produce and disseminate this information through partners and wider mining industry.

The second effort would be trying to characterize emissions from advanced engine technologies. I mean, MSHA does and can, for example, do evaluate engine technologies. They do certification. Certification, of course, has a limited scope. We would like to do a little bit more in-depth evaluation of these control technologies where we would basically try to understand what are their actual characteristics beside what is certification data telling.

Last year, I did a little bit of analysis, we did, actually, a little bit of analysis on underground mine diesel inventory. MSHA has a great database of all diesel-powered equipment in coal mines. Unfortunately, we don't have anything on metal/non-metal mines, but we can draw some conclusions. And what we found, that, you know, state-of-art now in underground coal mining industry

is not much different than one in beginning of this, you know, century.

There's still a lot of Tier 3, Tier 2 and 3 Tier engines, particularly in, you know, permissible heavy-duty and non-permissible heavy-duty arena. And then, of course, probably very few engines were purchased since mid 2000s. Only 54 of 1,253 non-permissible, heavy-duty, vehicles powered by engines approved after 2010. That's not number showing that industry is doing great effort in replacing diesel engines in underground coal mines.

And then, of course, we heard, I think in the comments, and might be in mine, you know, I don't know, .5 percent of all engines, non-permissible, light-duty, vehicles are currently powered by engines that meet Tier 4 standards. And we are talking only about very minuscule amount of very small engines, and most of those are less than 25 horsepower.

So, basically, what I think we don't see is that quick replacement of technology, diesel technology in underground mines. And reason, you know, why I'm mentioning that, because all the regulations -- both regulations, metal/non-metal and coal mines were introduced under assumption that over the time, diesel-powered -- diesel engines -- older

technology diesel engines will be expunged from industry and replaced with modern engines. That's little bit on a slow pace according to the analysis I have seen.

So, basically, we have diesel engines which are very durable, reliable and they can be rebuilt also. So, basically, we have, you know, unfortunately, you know, we haven't seen too many advance -- too much of advancement in diesel technology ever since we introduced regulations.

So slow penetration of advanced engine with extremely low particulate emissions. Now I mean Tier 4 final engines emit like 99 percent less particulate metal than the engines we discussed in 2001. And so, basically, we have the -- if we don't start introducing these engines, we are not going to see earth-shaking changes in the exposures.

So, basically, what we are planning to do about this is first to help industry to facilitate selection and introduction of new, viable engines in underground mining industry. Same as with DPFs. You know, we tried to show which of the products are better than the others. And the same with engines. Not all the engines are created as equally. Not all the engines which are even currently approved by MSHA

or CANMET are not producing the same effect on the reduction of the emissions. So, basically, by trying to point which type of technologies are, you know, better than the others, we will try to help industry to guide them to introducing better products in underground mining industry.

And then, of course, this type of intervention would benefit anybody and anybody, you know, who is exposed to DPM because, you know, controlling emission at the source actually helps everybody. And then, of course, we want to prevent potential introduction of the engines which, you know, introduce new, unwanted emissions. We have seen that with the catalyzed diesel particulate filters when we saw sudden spike in NO_2 emissions. We have seen that with the platinum catalyzed DOCs.

So, basically, you know, we need to weed out those products which are not suitable for underground mining industry. We are planning at least for now, we have two engines in scope to test and they kind of spend what currently industry is doing in the heavy-duty and light-duty arena. And we are planning to test here for final engine, which is using SCR-based solutions, so there's no DPF on it. And those type of solutions are more palatable for the mining industry

because DPFs are still relatively difficult to operate in difficult environments like underground environment.

And then, on light-duty, we would like to test engines which are equipped with DOC and DPFs just to show that some of the Tier 4 final engines which are currently coming on the market which do not have those control strategies are not really that clean. So the evaluation would take place in the NIOSH PMRD diesel laboratory. And on the right-hand side, you have two pictures of it.

The engine will be operated at selected steady state in transient conditions. Detailed characterization of regulated and unregulated emissions will be produced. And special attention will be given to potential generation of undesired secondary emissions, like NO_2, N2O, nucleation mode aerosols, metallic aerosols, and other pollutants.

So then, if we successfully find engines which can be implemented and we find partners in industry, we would like to put same engines or similar engines in underground environment and test those in isolated zone or even directly in a production scenario. And then, as usual, we would publish this in peer-reviewed journals, conferences, and workshops

and disseminate information to the parties.

Specific aim three is dealing with trying to introduce novel technology, how to control exposure of certain occupations because we notice with -- and we evaluated, basically, canopy air curtains at our place at NIOSH PMRD, and we looked to that as a control strategy for dust. And it showed that it can reduce, effectively, dust concentrations. Of course, we know from experience with enclosures with cabs that, basically, filtration systems which are typically used on cabs to control dust exposures are not efficient in controlling DPM exposures.

So what we would like to try is to evaluate this technology, improve it, develop it and improve performance to provide better protection from DPM. We see this as a potential of this as a control strategy for some, you know, occupations like scalers or somebody who is, you know, say metal on those coal mine outside of the environmental enclosure and cannot be put in environmental closure, but it can -- it has some workspace where we can form this canopy air curtain.

And then, of course, we are hoping that some FERC bodies will develop this technology, and we are probably going to fund some of those efforts under

contract. And then, eventually, we are hoping for good products which we can go and evaluate and basically present to the industry.

Environmental enclosures are extensively used by a number of the mines to control not only exposures to DPM but also to the elements, noise, dust. So they are pretty popular, so, you know, our group of researchers from our place studied the role of these particularly protecting workers from exposure to dust and diesel, and we found that certain improvements could be done to these enclosures to make them suitable for protecting underground miners from DPM.

So primarily, you know, filtration system would need to be upgraded. We need also to work on better pressurization of the cabs and preventing leaks. And then, of course, education of the operators to prevent -- to actually maximize benefits of enclosing them in the cabs.

We did some studies, and usually what happen when you go in a mine, you find that you have a perfectly built cab, you know, with a HEPA filter on it which is 99.99 percent efficient. And then, when you look through the, you know, whole process, you'll find that those cabs do not really provide that type

of protection. You know, protections are much lower than somebody would mathematically expect to be there.

So, basically, we need to work on that because, I mean, some of the reasons are that people are not really taking full advantage of those cabs. There's a lot of openings on the cabs which are unnecessarily open and provide leak points and penetration of the dust, and the DPM occurs there. And then, of course, just behavioral issues. So, basically, we have to work on those to improve them.

So specific aim will be executed in a partnership with OEMs and aftermarket filtration and pressurization companies because we want to find solutions for the existing cabs because there are a large number of existing cabs which are not suitable really to provide any protection to DPM. And then, of course, we need to work on defining what the brand new cab which is supposed to protect miners from DPMs should constitute.

So not all environmental enclosures with adequate filtration and pressurization systems will be evaluated in the field and eventually implemented with help from industry partners interested in deployment of such technology. The effectiveness of enclosures in reducing exposure of operators to diesel and other

aerosols will be tested in an underground environment in cooperation with industry partners. And then, of course, findings will be disseminated to the partners.

And about disposable filter elements, that's something what we are wrestling for a long period of time. DPFs, basically, are the workhorse of, you know, coal mining industry. All the permissible, heavy-duty, vehicles and substantial fraction on non-permissible, heavy-duty, vehicles and small fraction even of light-duty vehicles, those primarily retired heavy-duty vehicles, which are turned into light-duty vehicles, are equipped with DFEs.

So, basically, this is technology which is very critical to the controlling DPM in underground coal mines. You know, that's the technology which in the 1990s was, you know, early 1990s was introduced by U.S. Bureau of Mines and basically allowed controlling DPM emissions from heavy-duty pieces of equipment below 2.5 grams per hour.

And, you know, in all our testing, we found that HDDFEs with accumulated DPM in them are very effective. You know, we know that those filters can reach, you know, even 99 percent efficiency and that they recognizes that. The only problem is, in a number of the studies we conducted and surveys, is we

see continuously that the products -- certain products which within, you know, at some point that might have some deficiency. They're still, you know, dominating industry and they're still used, I guess, and reason is probably economics because, you know, a lot of mining companies are already agitated at the fact that they have to pay these DFEs whatever they have to pay.

And then there are more expensive, better products, but it's very hard to decide why they should pursue those. So, basically, we noticed that a couple issues of gassing process during the heating up, first initial heating up of the filter, you know, a large concentration of aerosols happen in the ambient air. And then also we noticed that efficiency of these filters at very beginning when they, you know, don't have any DPM collected on them and over the extended period of time, you know, you're talking about first couple hours of operation, are not as stellar as they are in the later hours of that. So, basically, you know, this was recognized, and I know that in Australia, people looked into this and there are products already which claim that you can have this efficiency from very first moment of putting the filter on the vehicle.

So how we would do this. Work would be done

at PMRD diesel laboratory and we'll evaluate effectiveness of these selected DPF systems. We will benchmark them against existing products just to demonstrate, you know, differences, what new products can do. And we will work also with some of these manufacturers to develop better products. And then, of course, we are hoping to put this technology in some metal/non-metal mines because we have limitation how much evaluation we can do in coal mines. But, luckily, there are gassy mines in this country which use similar technology, and we can introduce this technology in those mines and try to demonstrate that also to underground coal mining industry.

And then, of course, you know, we have to make this technology better and that's our goal. Again, you know, all the information will be shared with industry and with definitely partners.

So what we are doing currently, and I think this is part of that effort, is we are looking for partners. We are looking for the comments, suggestions and ideas, you know. This is, you know, something what is in the making, and we would really appreciate if you have better insight in some of these issues, and if you can feed us with information, we are more than open to accept any suggestions.

So that would conclude my presentation and, you know, yeah. This is a nice DPM coming out of the diesel-powered truck which is trying to break 200 miles per hour speed limit at Salt Flats. So, yeah, I use this slide often to show that performance doesn't equate to the low emissions.

MR. MONINGER: Does anybody have any questions?

(No response.)

MR. MONINGER: Is there any questions on the phone?

FEMALE VOICE: If you would like to ask a question, please press star one on the phone and record your name. One moment, please.

(Pause.)

FEMALE VOICE: I show no questions at this time.

MR. MONINGER: All right. Thank you.

MR. BUGARSKI: Thank you. Thank you.

(Applause.)

MR. MONINGER: Next up, we got Link Bowers.

MR. BOWERS: Thank you. Hello, everyone. My name is Link Bowers. I'm with the MSHA Technical Support in Pittsburgh, PA. I work in the Environmental Assessment and Contaminants Control

Branch, otherwise known as the dust field group. Today I'll be talking about control strategies; the effectiveness of diesel particulate matter exposure controls: ventilation, environmental cabs, and administrative controls; and emission reductions.

First of all, on control strategies, DPM reduction depends on exposure controls and emission reduction. Your exposure controls are ventilation, environmental cabs, and administrative controls. Emission reduction depends on the diesel engines, which is your source, engine maintenance, biodiesel fuel, and after-treatments. And one thing to keep in mind is almost all mines will require a combination of these controls to obtain compliance. So it's the suite of controls to help you out.

As far as the effectiveness of DPM exposure controls go, ventilation would depend on the nature to upgrade, whether it be increasing your air or fan or maybe even just tightening up your ventilation controls. And improvement will be roughly proportional to the increase in your air flow increase. Environmental cabs can give up to 80 percent reduction, so 80 micrograms per cubic meter we have seen reduced to 160 inside a properly maintained and sealed cab. The only problem with cabs

is some people's job requires them not to work in the cab, so they can't use them for that condition.

And then the third one is administrative controls, which are defined as specified changes in the way work tasks are performed that reduce or eliminate the hazard. One example is restricting the amount of diesel-powered equipment and total engine horsepower operating in a given area so that you bowl over, tax your ventilation system that's in place.

Now on to a little bit more detail about ventilation. Your DPM reduction is basically proportional to air flow. So, if you double your air flow, you're going to cut your DPM in half. So you'll have a reduction in your DPM. Increasing the ventilation, though, can be costly, especially if you use major upgrades.

But sometimes you can just change the conditions in the mine or your ventilation controls to make your ventilation system more efficient. But if you were just increasing power itself, when you increase the airflow by 25 percent, you're going to double your cost. And if you increase your air flow by two, you're going to have eight times your electricity cost. But usually, you can just make your system that's in place more efficient is the best way.

Place your fans in the right positions, advance your tubings, make sure that you have everything the way it should be.

One factor for diesel engines is called the Particulate Index, which is defined as the air flow quantity needed to dilute DPM emissions to 1,000 micrograms per cubic meter of diesel particulate matter. So, for example, if your PI for one engine is 1,000, then if you double the PI, you're going to cut it half. And if you take it by five, you're going to divide it by five. So, if you increase your air flow, you're going to basically cut down on your diesel particulate emissions. And we have the listing of the PIs for each engine on this website at the bottom of the screen.

And just as an example, if you had two engines, one's basically -- they're both 150 horsepower engines, one's a Tier 1, one's a Tier 3, and the PI for the first engine's 23,000 CFM, the PI for the second engine is 4,000 CFM, as you can see, to get to your 160 DPM concentration, you're going to have to have 115,000 CFM for the Tier 1 engine, as opposed to 20,000 CFM for the Tier 3 engine.

And while boosting your airflow is a good start, you also need to direct where the air is going

with wall stopping doors, et cetera. And you also want to make sure that you don't have re-circulation or short circuits and that you ensure that your air reaches the working areas and faces of the mine.

In the ventilations system layouts, you want to try avoid adjacent intake and exhaust openings so you don't have re-circulation. You want clean air to come in, pick up the diesel particulate and move it on. You don't want re-circulation, or the concentration will just keep on going up throughout the day because you're not sweeping the air out.

And then, for distributing air underground, auxiliary fans and ducts, rigid or flexible, for development ends. You need your end one to be on fresh air and you want to maintain your duct work, make sure it's advanced to where you need it to be. Plus, make sure it doesn't have leakage. Maintenance is a big thing on some of these mines to keep up.

And you also, if you're using free-standing fans without tubing, you want to make sure they're properly placed so that you move the air where you want it to go to sweep across and move your diesel on. And also, in some mines, make sure your brattice lines are properly maintained so you're moving the air where you want it to move. And here's an example of a free-

standing fan. You want to make sure to set up where it's going to sweep over the operator and back out. So the angle off the rib and fan placement are critical parameters for a free-standing fan.

And on an auxiliary fan that has duct work, you can bring the duct work up closer to the miner where it's needed. And your critical parameters are your fan placement, your fan horsepower, the duct length and diameter. Duct bends, corners and leakage also come into effect when you're calculating what size fan you may need. And also natural ventilation. So mostly metal/non-metal use natural ventilation and it's impacted by differences in air density and elevation. That's what drives the flow. And it's most significant in mines with limited mechanical ventilation pressure and large differences in elevation. And with natural ventilation, you can have air reversals possible because of just natural conditions there at the time.

And another way to reduce ventilation is to -- I mean to reduce DPM emissions is to use environmental cabs, and they help silica, DPM and other dust exposures, but they also can help with noise exposure reductions. And some things to consider when you're looking at environmental cabs is

you want them to be tightly sealed with no openings. If you have something broken, you want to maintain, like a window, you need to fix it when it gets broken or seals on the doors.

You want to make sure it's pressurized with filtered breathing air, and usually the change-out schedule for those filters is about 250 CFM, I mean 250 hours, and you want to basically design them for one air change per minute. So, if you have a 100 square foot cab, cubic foot cab, you want a 100 CFM fan to do that change-out. And you also want to make sure they're being operated with the windows and doors closed because, if you have the windows and doors open, you're basically negating the use of the environmental cab. And you also just want to make sure they're maintained in good condition.

One way that we test a cab for positive pressures is we will close all the doors and windows in the cab, turn on the A/C fan blowers that's pulling the air out so it's pressurizing the cab. Then we'll take a Magnehelic Gage and attach flexible tubing to it, open up the door on the cab, and then close the door to make sure that the hose doesn't pinch so you can see the differential pressure. We'll usually use a half inch mag to do that with, and we want to see

about a .1 inch water gauge or more pressure differentials that show that air can't infiltrate the cab. You have positive pressure trying to keep the air outside out.

And another set of controls are administrative controls, and that's controlled DPM exposures through operating procedures and work practices. And some examples of those are minimize engine idling and lugging so you're not making DPM that you don't need to. You want to keep your fuel and lube oil clean. That'll help DPM emissions go down. And if you can, utilize traffic control and production scheduling so you can keep heavy traffic downstream from miners who work outside of cabs. Like your powder crew, since they're not protected by a cab, usually it would be good if you can schedule where they're not getting the exhaust from other equipment going by if you can. And route haul trucks in return air is another one that you can do.

And also schedule blasters on non-load haul shifts so that they could be working when there isn't as much diesel haulage going, but that just depends on the mine itself and its mining cycle. And also limit the horsepower in the area based on available CFMs so you don't stress the ventilation system for helping

dilute the DPM. And also to keep cabs and doors and windows closed on environmental cabs so that they're doing what they should be doing, protecting the miner.

And emission reductions, this is basically reducing the amount of emissions coming from the engine itself, so the source -- now you're looking at the source instead of trying to protect somebody from what's being produced. Now you're trying to just reduce what is being produced as far as diesel particulate matter. And some of the ways our newer engines produce lower DPM, diesel particulate filters can be used to remove DPM. Alternative fuels like biodiesel can be used to reduce DPM emissions. And maintenance programs to ensure that what you're doing is staying properly maintained and working properly.

Here's an example of a newer engine compared to some of the older Tier engines over the past few years. Of course, newer Tier engines produce lower DPM emissions, and this example of engines that are in the 175 to 300 horsepower class, in 1996, a Tier 1 engine would produce about .54 grams per kilowatt hour of DPM. The Tier 2 and 3s are similar for DPM emissions and they would be at .2 grams per kilowatt hour. And then, as you can see, in 2011, when the Tier 4s are coming out, that you're down to .024, I

mean .02 grams per kilowatt hour, which is 27 times less than a Tier 1 from just several years before. So you can see the reduction over the course from '96 to 2011 of what's available. But, of course, you also have to consider the financial cost and if you're going to buy a new piece of equipment, you can keep that in mind.

And another way to reduce emissions of diesel particulate is using diesel particulate filters, and there are several types. You have throw away paper filters, and then you have other filters that can be regenerated, which means cleaning off the diesel particulate matter either passively, which means it does it itself, or you have to actually physically go in and do it. And you have passive regenerative ceramic filters and they self regenerate based on duty cycle. Active regenerative ceramic filters, they need a regeneration station, so you've got to take that into consideration that you're taking off and the time to put it on something, clean it and then put it back on. So different mines, some are more suited than others depending on their mining cycle.

You also have a fuel burner with ceramic filter, and that one creates a temperature as in a

passive type system. You have sintered metal fiber filters, which actually use electrical heating on board for onboard regeneration. Then you have disposable paper filters. But the paper filters, you have to have a cooled exhaust in order to use those because they can burn if they get to too high of a temperature. And then you have a high temperature disposable filter and its filter life is based on the duty cycle and operating time. And we actually have a MSHA filter listing also on our website and it's located below.

And another is biodiesel fuel blends is another way to reduce DPM emissions from an engine. And biodiesel is a registered fuel with the EPA. It's a fuel additive -- has fuel additives added in. It has ultra-low sulfur diesel fuel. It is made and dried from vegetable oils and animal fats. And sometimes it's blended with standard petroleum based diesel. So sometimes you'll have a B20, which is a 20/80 mix, or you'll have a B10, which is a 10/90 mix, different mixes, and they significantly lower your elemental carbon emissions. Just that some people have also seen NO_x's go up with using it, so you've got to be aware of that when you are thinking about using that.

And if you transition from standard petroleum to a biodiesel product or a high biodiesel blend, you have to consider cost, the quality and availability, its low temperature properties because some of them will gel up earlier than they would with normal diesel, solvent effects on some of your equipment. There may be some scrubbers that it'll react with that regular diesel wouldn't. And microbial growth, that means bacteria can actually grow in the biodiesel, so usually they'll put an additive in for that than it would in a normal diesel. So that's your long-term storage stability also.

Energy content usually doesn't have as high of a energy content so you're going to use more gallons of biodiesel than you would with regular diesel in some cases. And also, maybe your oil change intervals may go down because of using biodiesel. And, basically, you had the three exposure controls that you need and four emission production controls, which are your, for the exposure controls, the ventilation, environmental cabs, and administrative controls, and your emission reduction or the type of diesel engine you're using, the engine maintenance, your biodiesel fuel and your after-treatments, which are your filters. And usually you're going to have to

use a combination of these seven things to get in compliance.

We have a diesel particulate single source page and it's located here. And these should be up on the website, I think, sometime -- all these presentations, so you can pull the links from there. And also, if you have any questions, feel free to contact me. Here's my contact information and phone number, and my group would be glad to come out and help and try to help you out with your problems. And that's it. Thank you.

MR. MONINGER: Does anybody have any questions?

(No response.)

MR. MONINGER: Open the phone line.

FEMALE VOICE: If you would like to ask a question, please press star one on your phone and record your name. One moment, please.

(Pause.)

FEMALE VOICE: We show no questions at this time.

MR. BOWERS: Thank you.

MR. ANGEL: Next will be Jeff.

(Applause.)

MR. MONINGER: Okay. I'm Jeff Moninger.

I'm here from the Mechanical Safety Division, the Approval and Certification Center. I'm just going to talk briefly here on the culprit for the diesel particulate matter being the diesel engines.

Just quick background, MSHA regulates diesel engines differently in underground mining for coal mines. Underground coal mines must use an MSHA approved engine, Part 7. And in addition to that, the engines also must meet the Part 72 health standards for the diesel particulate matter. Underground metal/non-metal mines have the option, they can use a Part 7 MSHA approved engine or they can use an engine that meets the particulate matter in Table 57.5067-1, which is basically a Tier 1 or Tier 2 DPM limit for the engines depending on the horsepower.

What's an MSHA approved diesel engine? MSHA approves diesels underground into two categories, Category A being used in the gassy areas of the mine or permissible areas, Category B engines being outby or all the other areas. A listing of the engines for Category A and Category B are available on our website. You can go under this link or through the support and resources equipment Approval and Certification Center and then the Approved Diesel Engines.

DPM emission limits for underground coal mines dates back to the health standard, Part 72, require permissible equipment and heavy-duty equipment be limited to 2 and a half grams an hour. Basically, that means a diesel engine underground, as everyone's talked about, would have to be filtered to get down to that 2 and a half grams an hour limit. Light-duty equipment is limited to 5 grams an hour or it can meet the table listed in Part 72.502, which is a DPM limit based on Tier 2 engines. So, if you have a Tier 2 engine, Tier 3 or Tier 4, it's going to exceed that and be okay to use, along with being Part 7 approved.

New technology diesel engines include exhaust after-treatment devices to reduce tailpipe emissions. By this, I'm talking your Tier 4 engines. Basically, they use either a diesel particulate filter that usually incorporates a diesel oxidation catalyst and some EGR or exhaust gas re-circulation with the engine to help lower the DPM. Or the other system used frequently is a selective catalytic redemption system, which injects diesel exhaust fluid or urea into the exhaust stream to help lower the NO_x emissions.

This is a quick example of some diesel engines that MSHA has approved. The first one up

here, I'm trying to show a 185 horsepower engine at 2200 RPMs. The first engine up here, a Category B, emits about .22 grams of horsepower hour, which exceeds the Tier 2 limit for that horsepower rating, which would be .15 grams of horsepower hour. However, we have some of those engines approved for Category A use basically using a -- going through a dry system technology or dry system scrubber, basically, a radiator to cool the exhaust and then the exhaust is then filtered.

So, with a diesel particulate filter, the DPM is lowered to about .009 grams per horsepower hour, you know, exceeding or being below what the Tier 4 limit is for that, which is like .015. Also, we have a similar system that incorporates a diesel particulate filter and a diesel oxidation catalyst, which we believe, based on the calculated values, would drop it down to about .007. So even though, you know, permissible engines, Category A engines may exceed may -- the engine themselves may be, in this case, you know Tier 1, Tier 2 or Tier 3, once you throw a filter on there, you're going to reduce the DPM and lower it below the Tier 4 limits.

This is just another example. This is a straight Category B engine showing at 200 -- this one

didn't quite turn out as well because the Category B engine's a 215 horsepower 2200 RPMs. It's .13 grams per horsepower hour engine, which is, basically, it's either a Tier 2 or Tier 3 engine, but we have a similar engine approved under Tier 4 using diesel -- which incorporates a diesel particulate filter and a diesel oxidation catalyst. DPM goes down to about .010 grams per horsepower hour.

Similarly, the same horsepower rating, 200 horsepower, we have a system that incorporates the diesel exhaust fluid, which injects the urea into the exhaust, also comes out with the same number for the DPM of .010. I'll point out these Category B engines on this slide are all actual values from the test data. The Category A engines are usually more based on calculated data on what we expect the particulate filters to do.

New technology diesel engines are available for metal/non-metal mines in pretty great numbers. Simply, as I stated before, because they're not confined to using a MSHA approved engine, they can just use any engine that's going to meet the health table out there, which is limited to Tier 1 and Tier 2. So, if you have a Tier 4 engine, you can buy it and bring it in.

Coal mines are starting to have some newer technology diesel engines available. Unfortunately, it's a limited number just because of what the industry has brought in or diesel engine manufacturers have brought in to be approved. But we are starting to see some of that newer technology brought in for MSHA approved Part 7 engines.

Effective controls to reduce DPM emissions, some of what Link was saying, new technology diesel engines produce lower DPM emissions. If you have lower DPM emissions, you have lower issues. The diesel particulate filters work to remove the diesel particulate matter. Alternative fuels reduce DPM emissions. Most of the time people think of alternative fuels, they're thinking of biodiesel fuel. The higher concentration of biodiesel fuel you have, the greater reduction you're going to see in total carbon. However, if you're going to use like a B99 or B100 biodiesel fuel, I'd recommend that you use a diesel oxidation catalyst and incorporate that into your system to help remove the organic carbon or organic compounds that you're going to have with the biodiesel.

I'll backtrack a little bit, put in here with the Tier 4 EPA, Tier 4 approved diesel engines

that incorporate diesel particulate filters and the diesel exhaust fluid, basically, they're coming from the manufacturer with very low DPM, so there's not much, if anything, to be gained by using biodiesel fuel in those type of engines because they already have low DPM. Along with that, we recommend with the Tier 4 diesel engines, if you're going to incorporate fuel additives, even though MSHA's guidelines require it to be EPA certified fuel additives, that you check with the manufacturer to see if it's going to have any alternative effect with the after-treatment system.

Moving on to maintenance program ensures methods are working properly. Basically, if you have a maintenance program that measures the diesel emissions when the engine comes in or during its working life, you know how it's being maintained and if you have issues with the engine or increased DPM during that engine's life. Environmental cabs are always, you know, as Link mentioned, a good way to reduce DPM and ventilation. And that wraps up my part of the time. Does anybody have any questions here?

(No response.)

MR. ANGEL: Any questions on the phone?

FEMALE VOICE: If you would like to ask a question, please press star one on your phone and

record your name. One moment, please.

(Pause.)

FEMALE VOICE: We do have one question. Please hold.

(Pause.)

FEMALE VOICE: Our first question comes from Mr. Raymer. Your line is open.

MR. RAYMER: Yeah. I was just wondering if they had done any tests with the fuel additives and some feedback that you can possibly extend some regeneration cycle times and reduce some DPM filter issues by having some additives with the fuels.

MR. MONINGER: Yeah, there's been some testing done, more just in general with the fuel additives, but there's never been enough extensive research done to show, you know, one way or the other if they would increase or decrease the life. Again, we do know there's some issues with the Tier 4 engine possibly with fuel additives maybe being a little detrimental to their after-treatment. So that would be, you know, something to look out for, maybe something NIOSH could put on one of the things to look at with their testing.

MR. MONINGER: Any other questions?

FEMALE VOICE: We show no further questions

at this time.

MR. MONINGER: All right. With that, I know we're running just a few minutes late, but we'll go ahead and take about a five- or 10-minute break and come back with George Meikle's talk.

(Applause.)

(Whereupon, a brief recess was taken.)

MR. MONINGER: All right. If everybody can sit back down and we can get restarted. Are we back online on the phone?

FEMALE VOICE: You are reconnected.

MR. MONINGER: Thanks.

MR. MEIKLE: Good afternoon, everyone. I'm Greg Meikle. I'm with the Mine Safety and Health Administration Coal Mine Safety and Health, Chief of Health, and I would like to go over a presentation that is to review the information on our coal mine underground diesel inventory. I want to preface, though, before we get to the bulk of the slides, there's a few things I want to say about this presentation. It is a snapshot in time and that time was in May of 2017. At any given time that we would take a look at the information in the diesel inventory, it's a dynamic inventory. By regulation, the mine operators have a seven day time frame to make

corrections in that diesel inventory.

We also have a couple of other things that need to be kept in mind. The inventory can include errors of input from the mine operators. It could have even errors in the information that was given. We'll talk about some of that that might even show up on this snapshot and our review of the information that is in there.

It'll also just be a presentation of the raw numbers. The information in the diesel inventory is not necessarily correlation to exposure to DPM by underground coal miners. And I say that by saying the information of the pieces of equipment does not indicate how that equipment is utilized, how long, where, so the information in there is a potential. We should use that information and be educated to what it represents.

Now, you know, the information on multiple slides that I'm going to give today also indicates the equipment's definition, its attributes considering it as a package, including the after-treatment that it was input into the inventory with. So, with that in mind, let us start.

Let's look at the diesel particulate or the diesel-powered equipment by state or by district and

by the numbers of pieces of equipment. And when you look at this information, the numbers of diesel-powered equipment by far fall into two different districts: District 8 and District 9. And then it is broken down by the numbers in the light-duty, heavy-duty, and permissible categories. We also have a category that we say is a number of other diesel-powered equipment, and other diesel-powered equipment would be equipment that shows up in the inventory, but when considering some of the time lags and other things that we find in the inventory, they really don't fall into a particular category.

So we have a mine that is a brand new mine and they're actually developing the mine. They've put together their diesel-powered equipment inventory, but that equipment is not currently underground yet. It shows up in the inventory. We also have mines that go bankrupt that are finished and they're abandoned. There's a number of reasons that mine operators, you know, that time to update the inventory has come and gone or is not expired yet so that that inventory can be corrected. So we have a number of pieces of equipment also that may fall, and you'll see in some of these slides, into shared equipment.

And I want to say shared equipment can also

be further complicated because I sold you a piece of equipment that I had on my inventory and you have a time frame to update yours, I have a time frame to update mine. So just keep in mind these numbers are good for what they can be utilized for, the potential for exposure to underground coal miners.

So we can see by district, when you sort by district, where the equipment in numbers are and how they're being categorized. So the top 10 types of underground diesel-powered equipment, 90 percent of which is represented by 10 different types. Now, in the inventory during this snapshot, we've inventoried 36 different types. But the majority of the equipment fall into 10 different types, and you can see personnel carriers far and above all the other categories or different types are the numbers of equipment that we have in underground coal mines.

Now, when you take that information and bring it into the types of diesel-powered equipment categorized as light-duty, you can see the personnel carrier again is the highest number of pieces of equipment in underground coal mines. It then potentially would represent the highest number of advances in protections. It may, as I said. And you can see then utility trucks, forklifts. But these

five different types represent 91 percent of the light-duty equipment or those that are categorized as light-duty equipment in the diesel-powered inventory.

For heavy-duty equipment, this is just heavy-duty equipment, and there's 10 different types of heavy-duty equipment that represent 92 percent of the heavy-duty equipment in the inventory. Load-haul-dumps represent the lion's share of it, but then locomotives and so on and so forth. So, for heavy-duty equipment, we see this sorted by the numbers of equipment we find in the underground coal mines.

Permissible equipment, those that were inventoried as permissible. There are five types that represent 92 percent of the diesel equipment in underground coal mines. And, again, load-haul-dump is the largest number of equipment that we have in underground coal mines.

Now we want to look at the numbers of mines, with diesel-powered equipment and after-treatments by state. We sort these by the percentage of the diesel-powered equipment with after-treatments, and what you find is those three states that's been previously mentioned in the prior presentations would lead the way. So, in West Virginia, Pennsylvania, and Ohio, they require diesel-powered equipment going

underground to have after-treatments. And so we would then expect that those pieces of equipment going in to mines in those states to be compliant.

And the numbers in this presentation are, again, from the inventory of May 4, 2017. And if the equipment going into these states should have after-treatments, I'm curious as to why they aren't all 100 percent. It gets back to an explanation that before I prefaced this whole presentation about. This is the information that was put into the inventory. Somebody missed a stroke or two or something happened with their computer. I mean, you know, it could have been they thought they sent it and it didn't get there.

But again, you know, when we see these by percentages for after-treatments, we see the potential that can be utilized in trying to protect or increase the protections for miners that are working in underground coal mines.

When we look at the after-treatment filters on light-duty equipment, we see that, again, the personnel carriers is at the top of the list. And you see what those filters look like, what they're categorized. And so we see, you know, after-treatment manufacturers are unknown. Again, getting back to the input information given by the mine operators, did

they know that information and fail to convey that information or some other explanation.

We see the light-duty with after-treatment filters and then the -- this is sorted by the light-duty with after-treatment. Now we added that last column to represent those that did not have after-treatment, and that would tell us that light-duty personnel carriers, 1743 didn't have after-treatment. Again, the potential where we might help with protections to underground coal miners given that these pieces of equipment are still in the coal mines and can be utilized maybe just as stringently if you want to call it that or as much as heavy-duty.

So we see these things sorted by, you know, light-duty and the different types and what the after-treatment is. These 10 types represent 95 percent of all the light-duty that have an after-treatment.

Again, with the same ideas, but on heavy-duty equipment, we see the load-haul-dump as that, on the top of the list. There's 12 different types, though, that represent 95 percent of the heavy-duty equipment with after-treatment, and you see how they have been classified and, again, the total number that do not have filters. We would expect that number to

be much lower, but, again, there are some problems in the transfer of information in this diesel inventory and the requirements then that are specified in 72.520.

Permissible. There are six different types that account for 95 percent of the permissible equipment that have after-treatments. Now we see that permissible and ceramic may be somewhat conflicting because, in previous presentations, we said, well, okay, these things, they actually operate at temperatures that wouldn't be conducive to permissibility. Again, the information on this inventory is what has been supplied by mine operators. Now there's a lag in us verifying, getting it cleaned up. So, again, you know, we understand those things. But here, we have permissible, we have with after-treatment, and what classifications of these applications that mine operators are actually utilizing. So we see what works if you use this information and look at it.

For the engine manufacturers, we see that Deutz is the number one, and the second leading manufacturer that's being utilized is less than half of what Deutz has got in the underground coal mines. Does that necessarily say anything? I'm not sure.

For those of you who know the economics, who know the performance, who know the longevity, all of those different input factors of why that engine manufacturer is being selected would be a good thing to start if you're trying to make an informed decision. And the top 10 manufacturers represent 97 percent of the diesel equipment, powered equipment underground in coal mines.

So now we want to look at what does the inventory say about heavy-duty diesel engines and how they equate to the diesel particulate and the Tier system that EPA has. Now 90 percent of all engines in heavy-duty diesel-powered equipment meet DPM levels for EPA Tier 4 engines, but that's based upon the package that includes the after-treatment. And we see a Tier 0, and a Tier 0 would represent equipment that really pre-dates the Tier system or before that designation or definition was set forth.

Now what does that tell us from the inventory? Well, coal mines have a way of utilizing their equipment, they get good equipment that'll last and they keep it. So, for future, when we put it in a coal mine, they want to use it a long, long time. So a good choice up front for a long, long time, it would be a really good choice.

Same thing for light-duty diesel engines and their designations, the difference being that 22 percent of all engines in light-duty DPM meet DPM levels for the EPA Tier 4 engines based upon after-treatments. Getting back to an earlier slide, not many of the light-duty personnel carriers have an after-treatment. Now they can meet our standards, 502, 72.502, and be utilized. How it relates to miner exposure, it's a potential. Seventy-seven percent of all engines in light-duty DPE meet the DPM levels for EPA's Tiers 2 and 3.

For permissible diesel engines and EPA engine standards, we see that 98 percent of all the engines in permissible DPE meet the standards based upon Tier 4 engines based upon their after-treatment. And, again, you know, four of the permissibility and being on this section, it's a requirement. So we see a high percentage of those meeting those standards, and for those that do not, we understand that it could be some complication with the conveyance of that information to the inventory and some other things.

The last slide we want to look at, it relates to another presentation slide, is okay, now understanding what is being used, what is needed I expect in underground coal mines, is what size of a

motor do I need or an engine in order to do the work I want it to do? And we see, for 97 percent of the diesel-powered equipment being utilized underground, they have an engine of 250 horsepower or less. So it's the new engine technologies being introduced, smaller engines and what not. It will be that the industry can utilize those smaller engines at least in the coal mines.

Now I think Monique, for our metal/non-metal mines, they have a whole another category of equipment and need than the coal mines do.

I know it was short, but that's the information we find on our diesel coal mine diesel inventory. I'll take questions now.

FEMALE VOICE: For those participating on the phone, if you would like to ask a question, please press star one and record your name. One moment, please.

(Pause.)

FEMALE VOICE: We do have one question coming to the phone. One moment.

MR. BUGARSKI: I have just one question.

FEMALE VOICE: Our question comes from Joe Betar. Your line is open.

MR. BUGARSKI: Go ahead.

MR. BETAR: I just wanted to point out, I guess this is both a question and a statement, but three times you mentioned that personnel carriers represent perhaps the largest potential for environmental exposure to diesel particulate. And your basis, it seemed, was simply due to the large -- them being the largest number of units in operation.

But I think what you probably need to consider is, is that those units by their very nature are also operated at the very lightest duty cycles in the mine, as opposed to a piece of equipment that's engaged in actively moving materials or rock or things like that. And, in fact, several years ago, I studied the fleet of personnel carriers at one of the largest operators of these types of units in the west, and, on average, those engines were operating at 12 percent of their rated load.

So I guess I would just want to include the fact that simply by nature of the sheer numbers of units and the fact that these units are not equipped with after-treatment doesn't necessarily mean that you can conclude that they may be an opportunity to greatly reduce diesel particulates because of the fact that these units are operating at such light-duty cycles.

MR. MEIKLE: I agree. And I would add to that in many of the mines that I've gone to, you know, the personnel carrier will take men and materials to the section and then be shut off, and then they will reverse that in the evening or the end of the shift. So it's not only the duty cycle, but it also would then have to consider, okay, the time of use. But it even goes further than that. The potential could include, okay, these others that are already meeting Tier 4, though, are very, very low and how they are bring utilized, the time frames and where and when and all the other things. So duly noted, what you just said. These are just numbers of equipment.

We had one here in the audience.

MR. BUGARSKI: Okay. I'm Aleksander Bugarski. My question would be related with your estimate that your Tier 0 engine, after 20 years standing in the mine, just by applying their fee on it would meet Tier 4 final standards. That's a little bit of a stretch, because, I mean, end use emissions from those engines are probably twice as bad as the new engines. And they are rebuilt like three times meanwhile, and nobody checks on the parts that are rebuilt, for example. So basically it's kind of a little bit of a stretch to say that they're equivalent

to Tier 4 final engines.

MR. MEIKLE: If I did equate them to Tier 4, I didn't mean to. Now they're in our inventory as not 2, 3, or 4. Okay. Zero one, that's where we put them just to say, okay, this is what we have in the inventory. But as to what controls can be applied to them, what controls are being applied to them, we only have in the inventory what we have. And again, you know, I think that my, I guess, way of thinking is, as we pick equipment, looking at how old that equipment is probably could be an indication of how long the equipment being purchased now will be utilized.

As to, you know, its miners exposure source, you can't look at the inventory and even estimate that, other than we know the sheer numbers of those that are in the inventory at any given point in time. Yes, sir. Well, hold on for our people on the phone.

FEMALE VOICE: We show no further questions at this time.

MR. SASEEN: George Saseen, MSHA. Just, Greg, to expand a little bit further on I think what you were saying and then to tie in what the gentleman on the phone just said. Yeah. As far as the duty cycle on those personnel carriers, a lot are pickup trucks and they are used lightly, and also, you know,

mines have reported, the record showed years ago in the original rule, mines reported a lot of use of their light-duty equipment and a lot of mines reported very little use on their equipment.

But remembering that the rule, the coal rule slide was based off of technological feasibility. And I think what you were trying to say, Greg, to enhance that is any effort that we have as the technology has advanced since, obviously, 2001, where we were talking only about Tier 2 engines because 3 and 4 didn't exist, but now they do. So any advancement on the technological front of advancing that will help exposures, like you were alluding to.

So, yeah, it may not be because, yeah, we don't see a high duty cycle made with these machines. Some of these trucks, pickup trucks have larger engines in them, so it does not take a lot for them to haul, you know, a man or a crew in and out because if it's, you know, not a steep climb in or out of the mine. But as far as technological feasibility, any advancement will help, as you alluded to, help the exposure, lowering exposure to the miners. Thank you.

MR. MEIKLE: Thanks, George. That's right.

(Applause.)

MR. ANGEL: And next up, we have Monique.

MS. SPRUILL: Good afternoon, everyone. I work in the metal/non-metal division as the Chief of Health. And today, we'll be discussing our DPM levels that we actually have for exposure in our metal/non-metal underground mines.

MR. ANGEL: Turned the sound down a little too much.

MS. SPRUILL: Okay. Let's look at our average concentrations. First of all, we'd like to thank our stakeholders and our operators because you've worked over time. And let's pay special attention to our -- I'm going to have to stand over here for a second, but I want to point out two different graphs for you.

The top blue line, being total carbon, and the bottom line that's red, is actually elemental carbon. So let's look at 2008 when our final rule was actually coming into being implemented for 160 micrograms per meter cubed metal for total carbon, and that would be your top line there. We can actually see that, from 2008 to 2016, there was actually a 42 percent decrease in total carbon levels. This is also consistent with our elemental carbon levels that have been decreased. That was actually by 47 percent. So over time, if you actually look at it

as we keep having our average concentrations of DPM, they keep declining over time.

Now this next slide which we'll do is these were the number of samples that we actually collect for DPM and this is actually in calendar year. And your samples that are actually exceeding the PEL were actually in your second column there, then their percentage. So our percentages were ranging in between 14 to 19 percent of our samples that are actually exceeding the PEL. But we're collecting around about 500 samples per year. And over this five-year period, we collected approximately 2600 samples. So, with this that we know right now, at a certain time period or anything else, with only 17 percent of those samples exceeding, so right now, we're actually -- a lot of our samples, we can say they're really compliant.

And so now let's go over our miner occupations. So here we're going to concentrate on the first five occupations. The number of samples that actually have exceeded the PEL, there were actually 438 samples that were actually collected. Now, for your blasters, 31 percent of our samples exceeded the PEL. Your front-end loader operator, 11 percent, your scalers, 9 percent, your truck

drivers, 7 percent, and your mucking machine operators, these miners were actually 6 percent.

But what's actually different among these operators? For blasters that are also known in other parts of the country as powder gangers, they actually have direct exposure. So, with this being direct exposure, where are they working at? They're working in the face. They're working in areas with poor ventilation. They're working in areas where they're not in those enclosed cabs which we're normally seeing. Also, they work in areas where equipment is running right next to their work location. A major big thing? They're working at the dead and the de-stress with more stagnant air.

Now let's go on to look at our front-end loader operators. They're also working at the production phase. They're spending time mucking and they're actually spending time idling while they're actually loading and while they're dumping. Another thing, they're working down through the motor while they're dumping. They work in open, also in enclosed cabs. But we want to see why would they still be actually number two of our number of samples that exceeded this PEL. So they also work with these machines called skid stairs and they actually are

completely open without a windshield. So that level of protection that you would actually get in an enclosed cab, we're not seeing those.

Also, let's go on to our third category, a mechanical scaler. They're also working what? At the face. They're working in both open and enclosed cabs. They're working areas with poor ventilation, and they also spend time idling with this equipment while they're scaling.

Now we'll go on to our fourth category for truck drivers, still being 7 percent of our overexposures. They're primarily exposed to diesel equipment, one. They spend time idling while they're actually loading. They work downwind from the motor and they're also passing other trucks. So our truck drivers actually are exposed to other diesel exhaust and other engines while they're actually passing other trucks.

Now let's go on to our mucking machine operators. They also, what's the commonality? They work at the face. They actually have their engines idling while they're actually dumping. They work downwind from the motor and while they're tramming. So, if you're going from point A to point B, you're going to actually have your engine idling at point A

and also at point B.

Okay. Now we're going to go on to look at commodities. So first we're going to look at, in particularly, four different commodities: our crushed and broken limestone, and also gold ore, zinc, and also our lead zinc. Now 47 percent of our samples actually exceed the PEL for crushed or broken limestone, but they also make up 31 percent of our underground mines. Also gold mines. We go here where they actually make up 21 percent of our underground mines, whereas our lead zinc and zinc mines, they actually make up 3 percent of our underground mines. So let's keep those commonalities in place in our minds.

So, for crushed and broken limestone mines, what have we noticed? They're large-scale underground productions, these mines. Why do they have ventilation challenges? We've noticed they have some older equipment and with this poor ventilation, as this mine size actually expands, we know that the main fan is actually having problems getting air flow all the way back to the production face. Also, a few of our mines, yes, they still do have natural ventilation that they're using. Natural ventilation, what is it affected by? Seasonality. So, therefore, we know

there are temperature changes, we also know that there are barometric pressure changes.

The next thing they're using is this room and pillar extraction method. So you get these large open excavated areas in which ventilation is actually -- you'd have to overcome this challenge. And also they're normally working on a year-round basis. So, if they're working on a year-round basis, our miners are constantly being exposed. And also we know that some -- right after we looked at these mines, we know that some maintenance procedures, that they actually need to have in place, that we need to actually increase looking at helping our operators look at their maintenance schedules with these mines.

Next, we'll go on to gold mines. We've actually noticed that they've had poor engine maintenance and ventilation. A lot of our gold mines are using some older engines. They're operating diesel equipment with no filtration and with open cabs. And they're actually having some direct exposure. And actually, one of the processes that they're using is the ore is extracted through tunneling or shafts. So that's another ventilation challenge. And also, we have to keep remembering about altitude. So, with our engines, where are they

going to maximally, actually, where do we optimize our engines for altitude? So that's normally at 3,000 feet per max altitude designation. So, when you're doing particulate matter or maintenance schedules, we also have to consider altitude for our gold mines. It's another challenge that they actually have to overcome.

Now let's look at also lead zinc ore mines. Actually, more or less with these mines, the biggest thing that we're looking at is the single entry drifts that we actually have as a ventilation challenge. The miners need to access ore core deposits commonly known as chasing the ore, and this is along chasing across your vein. So what are you doing? You're actually creating tunnels and drifts along the vein. This is the major cause of the ventilation challenge. And there are also elevation changes that we see within the same drift.

Now the lack of ventilation at the face, we've also noticed that. So we say when you're obtaining air, you're trying to bag off air off the main ventilation using booster fans. Ventilation tubing may not be adequately sweeping the face, and that's another ventilation challenge that we've noticed.

Now zinc mines also have this -- just like lead zinc mines, they have the same type of mining activities that go on. We're still chasing this vein. However, our zinc mines were actually shut down for a while. When our zinc mines reopened, we noticed that they did have some newer equipment running at that time. So, for fleets with this newer equipment, zinc mines are actually overcoming a lot of their challenges.

But what do we have to do? Our biggest thing is have this multi-faceted approach, as we mentioned earlier. We need to control DPM actually at the source. And we're controlling our gases also and also controlling other pollutants.

So we've noticed that scrubbers are using our smaller metal/non-metal mines and they may produce DPM concentrations up to 10 to 20 percent. Our operators are also using filters. Paper filters may reduce your DPM concentrations by 85 to 90 percent, we've noticed. And then also, your sintered metal filters may reduce your DPM concentrations by 50 to 90 percent. And our ceramic filters that they're actually using may reduce your DPM concentrations by 85 to 95 percent. We've also noticed that generally they're using diesel oxidation catalyst, which may

reduce your DPM concentrations by 20 percent.

Let's go on and see what other things that they're doing successfully. They're using selective catalytic reduction, which is actually reducing your nitrogen by up to 90 percent. And another thing they're using would be low emission engines. The majority of our mines right now, we know from what we've actually been speaking with our health specialists that they're using Tier 3 engines or actually higher. And actually, also, we've said this earlier, there are environmental cabs on removable equipment.

But one thing that we want to explore a little bit deeper would be ventilation because they're actually exploring our operators, looking at both passive and active ventilation. So, with this, we've noticed that when you're actually placing booster fans that are actually out there and when they're placed at the face, which is a really important change, we've noticed that that's actually been for a lot of our operators that are actually able to lower their DPM levels. And they're making sure ventilation does not pass through a working area too many times. So they're directing this active ventilation. They've replaced a lot of their rigid tubing. So the tubing

that they actually have now is actually installed around the working area. So we're actually channeling this fresh air to the operating face.

There has been a removal of ventilation bags to a hard line smooth vent to reduce friction that's lost over time. And another thing that they're doing are ventilation studies with our single entry drifts because this has been one of the things we actually needed to look at.

What are they actually also doing? They're installing curtains, brattices, tubings, stoppings, and bulk heads. They're also adding fans or they're actually increasing the number of fans that they actually have. So this would be for main fans, auxiliary fans, booster fans, and also exhaust pulling fans. And also, they're filtering any type of re-circulated air.

And, again, ventilation studies not just in a single open -- single drifts, but we're actually looking at others. And all of our mines now are starting to look at ventilation studies. And they're also looking at open mines. We actually have noticed that they're installing some that might be more permanent solutions where they're using steel duct work.

They're also using ultra-low sulfur diesel fuel and your cetaine improvers, what they're actually doing is measuring that at 42 or greater and that's our target. They're using oxygenated additives, detergent, dispersant, surfactants, and for biodiesel, we've seen in metal/non-metal mines that they're actually using a blend up to 75 percent

But I'm not done yet. Let's go on to compare some of our success stories. I want to tell you about three different mines. We have a crushed and broken limestone mine that was a multi-level mine. Back in 2008, this mine had concentrations that were over 230 parts per million. So we would look at for DPM for micrograms per meter cubed, they were able to actually lower their DPM concentrations and also their exhaust concentrations. And we noticed their DPM concentrations actually fell below 100.

How did they do this? They placed DPM filters on older equipment. They replaced and rebuilt their fuel pumps. They actually went out and they actually refurbished their engines and actually really did go about re-tooling them. They also purchased newer equipment. They actually purchased fans and tubings actually to ventilate those actual dead areas.

How did they actually go through? They

contracted actually a ventilation specialist and actually mine engineers. And what did they do? They went and they reviewed all their ventilation plans and they made modifications to their ventilation systems. Also, with this particular mine, they were doing four directional mining there, and so they had to develop some type of connection system. And in that connection system, they actually used bidirectional fans. And they actually repaired and established new ventilation controls. They used stoppings and curtains. This particular mine is also using low-sulfur diesel fuel, biofuel, and they're actually also -- they conducted ventilation surveys. So from going from levels that were greater than 230 to actually being below 100 after that, they actually did actually place in a lot of work, and they worked with us.

Another mine that was actually a crushed and broken limestone mine, but instead of being multi-level, it's a single level. And they actually had the largest room of pillar mining method. They had concentrations of DPM that were over 250. But after 2009, they had no DPM concentration actually exceed 111. And their average DPM concentration by that time was actually at 41.

So what did they do? One of their steps, they had actually purchased newer equipment. They actually put in improved mine ventilation. They tightened all their stoppings. They added auxiliary fans behind the shot crew. They moved production faces from the back of the mine closer to the portals. They're using biodiesel fuel. They're also using the ultra-low sulfur diesel fuel. They actually did have rebuilt engines to improve engine performance, and they're using diesel particulate filters. But this one in particular, what they were doing is they're actually changing them out and they're actually using their filters for 500 hours. And they were finding that, before that, they were actually leaving their filters on.

Now let's go on to a lime mine. This is another mine that's a multi-level mine. Back in 2009, they had concentrations that were actually higher than 267. They were actually able to now after that point go below 40, which they had a really nice degree. So we wanted to find out exactly what everything that they actually do.

So, for the curtains, they did a lot of repair and maintenance work. And instead of actually having stripped curtains, they actually installed

these full-size curtains. They also put fans into their stoppings. They use biodiesel fuel. They also use ultra-low sulfur diesel fuel. And they actually ventilated their deadhead areas and all of their stagnant areas for air.

One other remarkable thing that they were actually able to do was use a real-time DPM analyzer. And if you're able to use a real-time DPM analyzer, they were actually able to go and say, how is our equipment functioning on a day-to-day basis. They were able to then monitor their ventilation and they actually corresponded this with exposure monitoring. So we did have three mines that we do have examples of and several others that were actually able to lower their DPM concentrations.

Does anyone have any questions?

(No response.)

FEMALE VOICE: If you have a question, please press star one, record your name and you'll be called on at your turn.

(Pause.)

FEMALE VOICE: So far, we have no questions.

MS. SPRUILL: Thanks.

(Applause.)

FEMALE VOICE: We still have no one queuing

up.

MR. ANGEL: Okay. I think that does it for all the presentations today. Next up, I'll introduce Dr. RJ Matetic.

DR. MATETIC: Okay. I think I know most of you in the room. If you don't know who I am, I'm RJ Matetic. I serve as the Director for the Pittsburgh Mining Research Division in Bruceton. I've got good news and bad news for you today. The good news is I'm last. The bad news is you're going to have to discuss some things before you walk out that door.

You know, one of the things you heard today was, you know, partnerships are great, but partnerships only are productive if people in the partnership provide input and guidance toward where things need to go next. And that's kind of what we're going to talk about a little bit for a couple minutes and then we'll break.

I think Dr. Kogel mentioned there are several partnerships, you know, that are happening within NIOSH currently. These partnerships only are productive because of the people that are involved in the partnership and that are actually providing input and guidance toward moving forward with a solution.

Ms. Silvey spoke about the first partnership

meeting for the diesel health effects was in, I think it was December 8 of last year at the Meadowlands. One of the couple things that we discussed there if you weren't there was the charter for the partnership. And if any partners or members of the partnership had any input to that charter, we can consider it there at the meeting or they can provide responses later on to add to the charter.

One of the other things that we discussed there was, obviously, how do we want to move forward? You know, you heard today from a lot of people. You received a lot of information regarding comments from the RFI, best practices to reduce DPM. You've heard from NIOSH regarding previous work that was done, current work that's actually going on, and future work that we're expected to do. You've heard from Monique regarding a metal/non-metal update, from Greg regarding diesel inventory related to coal and so on and so on.

So now we're at this crossroads of, you know, this partnership and the members of, where should we go next? You know, and I know that's a tough question, but there are people in this room that need to think about, like what are the things that keep you up at night that need to be addressed? What

are the topics that this partnership needs to move forward with for it to be successful and for the ultimate outcome to be the health and safety of the mine workers?

I think we all have a similar goal and that's that, meaning we're all looking at the health and safety of the miners. We have different roles in that on how that actually happens. But, ultimately, that's why we're here. So, with that and the significance of input, I'm begging you to open up and provide some input into the partnership on some topics, things that you're thinking about, and on the phone as well, that we need to like think about moving forward. So I'll start within the room and then we'll go to the phone. How about in the room? What can people share in the room? Thoughts? Comments? Where do we go from here kind of? Remember, you can't leave until you provide some sort of comment, and I'll stand at the door and won't let you out. So what is it that you're thinking about that maybe wasn't addressed today that the partnership truly needs to think about? Alex?

DR. BUGARSKI: Well, I would actually suggest, we have heard from NIOSH, we have heard from MSHA about the problems, and, you know, I would like

to hear from industry, you know, because I always believed in the past when we achieved some success that input from industry was most important one, because industry is the one which is facing the problems and they can point us in direction of the real necessity to do some issue.

For example, we have heard from Monique this high altitude issue and we dealt with this. You know, within MSHA and NIOSH, we dealt with this like 10 years back. But then it falls off the cliff and it's nowhere. So, basically, and you know I visited some metal/non-metal mines on high altitude last year -- this year, actually, and they all tell me how we have no clue, you know, how high altitude affects our engines.

So some of the issues, you know, like this emerge occasionally and I think it's the best if it can hear for the issues and the problems directly from industry and then we try to address things. And we will get partners. That way we'll be on the right, you know, page with them.

DR. MATETIC: Any additional thoughts in the room on that? I mean, I think it's a great suggestion. Other partnerships, we provide opportunities for operators to come up and provide

best practices, things that work for them that maybe we haven't thought about as a research organization or MSHA, that they bring things to the table that truly advance the science, which we didn't even really know about. Yes?

MR. MONINGER: Can you ask them on the phone if they happened to hear Alex's remark? Because I wasn't sure.

DR. MATETIC: Okay. People on the phone, were you able to hear Alex's comments?

MR. ELLIS: Yes, RJ.

DR. MATETIC: Ah, Mark.

MR. ELLIS: Hi. This is Mark Ellis.

DR. MATETIC: Hi, Mark.

MR. ELLIS: I'm in the virtual room.

DR. MATETIC: Okay. All right.

MR. ELLIS: And I don't know whether anybody can see me, but --

DR. MATETIC: We can hear you, though. But we don't see you.

MR. ELLIS: All right. I'll sit down, how about that?

DR. MATETIC: Okay.

MR. ELLIS: Okay. I'm Mark Ellis. I'm with the Industrial Minerals Association, North America,

and I want to thank you for a productive meeting. I compliment the speakers and the topics that they covered. I think they helped set the stage for this discussion now and the discussion going forward.

At the outset, I think I'm going to offer a challenge to the premise that typically dictates that partnerships end up in a regulatory outcome. Roz Fontaine mentioned two executive orders that had been issued by the President. The partnership was started under one administration, but it's progressing under another administration that's substantially different in its outlook. And so part of what I would like to suggest for the partnership is that regulations should not be the end game.

We all bring something different to the table. Jessica mentioned the silos that we're in and we tend to operate in silos. But when it comes to the issue that we're here to address, which is diesel exhaust health effects, everybody has a common interest in that, although they come at it from a slightly different direction, and I think that that's healthy. We need to try to make sure that we bring different perspectives to the issue, but we should focus in not on regulatory responses but really on improving miner health.

I happen to be a big fan of getting the biggest bang for the lowest buck, and I think that that could fit in with this partnership if we look at things like results-oriented prioritization. What equipment is out there producing the greatest contribution to diesel exhaust emissions? What occupations have the highest exposure?

Try to target where our problems are, the biggest problems, and try to find solutions for those problems. I happen to think that the idea of looking at best practices, what has worked in the past for some people to see whether they can work for other situations is a good way to go. I think that one of the challenges that we face is that there's a lot of subject matter here and it's difficult to deal with it in a general context.

So I guess the final point I would leave you with is that we could take any of the subjects that were brought here today and I think that we should dive into them in more detail in separate sessions. And what I would suggest would be a good one to work with would be to take a look at what Link Bowers and Monique Spruill brought to the table today. I think it lends itself to looking and best practices, what worked for people in the past, what could work for

people in the future. And I think if we could just get that far with the next meeting that would be a significant achievement.

DR. MATETIC: Well, thank you, Mark. How about thoughts on what Mark mentioned from the phone, in the room here or anyone else on the phone?

FEMALE VOICE: Sir, would you like all the lines opened on the phone for this part?

DR. MATETIC: That would be great.

FEMALE VOICE:: Okay. One moment.

(Pause.)

DR. MATETIC: I'm not sure how this all works, but I'm just winging it as I'm going.

FEMALE VOICE: All lines are open, so you do not have to press star one if you would like to make a comment.

DR. MATETIC: How about comments in the room regarding Mark's comments? I mean, I think, does it make sense 'til we kind of -- Larry?

MR. PATTS: RJ, I believe that --

DR. MATETIC: You're going to have to -- Larry, try to speak in I guess a microphone.

MR. PATTS: Okay.

DR. MATETIC: So they can hear you.

MR. PATTS: Okay. Fine. I really believe

that what Mark said and what the doctor said hold a lot of value. I think we need to see success stories and transfer those to people. But I think we also need to find out what doesn't work for the industry. I think we can learn sometimes just as much from what doesn't work to move in a direction to find things that will work.

DR. MATETIC: Okay. How about comments on the phone?

FEMALE VOICE: The lines are still open.

MR. BETAR: This is Joe Betar. I represent Chrysler Corporation in addition to my own enterprise as far as the mantrips that are produced by Chrysler under the Ram and Jeep brand. And I guess you asked what's keeping me up at night, and it relates to what the gentleman said about moving towards regulatory solutions here. From a manufacturer standpoint, the uncertainty as to the direction of where we're going to go with future engines and requirements is creating an enormous burden for us because we don't know what engines to approve or to seek approval for.

And since the time frames are so long for vehicles in terms of from, you know, beginning conceptualization to actual production, we could run into a situation where we actually approve engines

that either go out of production shortly thereafter or do not meet what could be potential regulations. And so the costs and the keeping awake at night factor are enormous when talk of, you know, reconsidering DPM regulations begin to float around because I'm at that point right now where we're getting ready to, you know, redesign engines, and there's a huge amount of uncertainty as to what we should be doing. And that's again staying away from a regulatory solution would be immensely helpful, because, ultimately, it reduces miners' choices for what types of vehicles they will have available to them to use.

DR. MATETIC: Well, thank you, Joe, for your comments. Thoughts on what Joe just presented?

MS. STIRLING: Yes, this is Evelyn Stirling, Cummins. I just want to echo what Joe is saying because we're getting into some next generation work which ultimately will reduce emissions. It may not meet the Tier 4 requirements. So do we go ahead and invest in getting certification, vent certification through MSHA on these engines or not? You know, so if we have a regulatory body that says you have to meet Tier 4 emissions on any future engines, then that really will put a heavy burden on us as engine manufacturers as well.

DR. MATETIC: Thank you, Evelyn. Thoughts here? On the phone? More thoughts? Alex?

DR. BUGARSKI: RJ, one more thought. I think what I'm hearing here, we have number of the problems. And related/unrelated they are in the envelope of diesel issues, you know. Certification issue, you know, personal exposure, you know, and this kind of stuff. So, basically, I think that the most effective way would be not to work as a whole group. We'll have to find some kind of subcommittees which are going to address these issues and work on it, because in smaller groups with pre-defined tasks, I think we have chance of success. If we hang like this and, you know, expect from somebody now to step in and say, oh, we'll come up with this solution right now, you know, there's no answers, you know. So, basically, if you don't specify very well problems and maybe vote on the priority of those and start addressing the most precious one, then we are not going to make enough progress.

DR. MATETIC: You know, Alex, that's a good comment because at the first partnership meeting in December of last year, I believe it was Mark Ellis that mentioned about working groups in the partnership, for example, looking at health effects,

looking at new and existing technologies, looking at improved technologies, looking manufacturers providing input to the group as well. So that's definitely something that I think maybe we can consider moving forward as well. Looking at working groups, it truly makes sense based upon what we're actually trying to do relative to this partnership. So it's a good comment.

MR. GREEN: RJ, this is Ed Green. Can you hear me?

DR. MATETIC: Yes, Ed. How are you?

MR. GREEN: I'm fine. I'm not going to get up where you can see me because it would be embarrassing.

(Laughter.)

DR. MATETIC: Okay.

MR. GREEN: Number one, I think this was an extraordinarily useful and important day, a milestone along the way for the partnership. So much was presented that, frankly, my old head is getting ready to explode. And one thing that I am worried about is that all of the presentations that were made today will be ephemeral. They'll disappear unless somehow they're put together. I know we're going to have a transcript, that's good.

But consistent with the important comment that Mark made on December 8th about working groups. Perhaps a next step along the way can be to put together a document, maybe a memorandum for the partnership that describes what happened today and sets out some next steps in terms of what else can be done in terms of research goals along the lines of Alex's presentation and the kinds of best practices that were described by our MSHA colleagues.

One thing that troubled me a lot was that, in spite of the fact that Monique's presentation shows that exposures have gone down in terms of what comes out of the tailpipes; there are still a fair amount of excursions above the PEL. What's that all about? I think that's worthwhile exploring.

So there are some, at least some initial thoughts, and I'm pleased with this next -- this second meeting, and I think we need to really focus now on what the third meeting should be and use this meeting as sort of a way to describe what has happened here. And my view is that a memorandum from NIOSH and MSHA to the other partners would be a very, very useful milestone along the way.

DR. MATETIC: Okay. Thank you, Ed.

Additional comments from Ed's comments?

Thoughts? Sheila?

MS. McCONNELL: I have some.

DR. MATETIC: Okay. You might -- I don't know what you got to -- I don't know what you have to use, Sheila, so people can hear you.

MS. McCONNELL: This is Sheila McConnell, Director of Standards. Ed, I thank you for your comments and I agree that it would helpful if we did, you know, following Mark and Alex's and some of the other comments, it would be helpful if we did break this down into finer points. So the question is, and this is a struggle I've been having, is what would those finer points be? I think we have this general conception that we need to do that, but what does that mean? Does that mean do we take a look at particular best practices in general? Biofuel, ventilation.

Do we look at types of engines that are within different sectors of the economy -- I mean the mining industry? Coal versus metal? So it would good to hear some more specifics on what -- and hearing from not only our operators but even the engine manufacturers that are listening in today. What are some specifics in terms of helping NIOSH and MSHA make those next steps?

And I guess the next question I have is, Ed,

and we can talk about this -- you can think about this and follow up on this. In your recommendation for a memorandum, I'm not quite sure what would be the differentiation between a memorandum with the partnership and a charter. So I would need more to know about what that would look like. And maybe, you know, my colleagues at NIOSH have a better idea and, you know, a sense that, you know, of what that would look like or that I'm just not aware of.

So, in general, I agree with everyone with everything that they're saying that it would be good to have separate, more precise tracks on different topics, but I would appreciate a little bit more guidance on what they would be.

MR. GREEN: Let me pop back in for a minute. I'm not suggesting that. The document I'm talking about would be different than the charter. I think the charter is fine as far as the goals. It's a good post along the way too. But I think today, unless we get down on paper what the hell happened today, we'll lose it.

And I think a task that MSHA and NIOSH can do is that, once you've got the transcript along with the PowerPoints that, you know, presenters used today, I think putting all that stuff together into a

memorandum that they're not minutes, but it's basically a description of the things that were talked about today. And I think that will focus as sort of a good reminder to everybody about what we're talking about and can serve as a document from which we can then develop working groups and that sort of stuff, because we do need working groups. You know, the differences between the coal legal regime and the metal/non-metal legal regime is absolutely critical.

And I hear loud and clear the comments from the Chrysler person and the, I think it was a Cummins person, about their frustration dealing with what MSHA requires and what EPA requires. You know, we can't fix that, but we need to at least identify it and see if there's anything that we can do to assist that. So I'm not talking about a modification, Sheila, to the charter. I'm talking about basically a memorandum that sets out what we discussed today and then maybe sets out some next steps, if you will.

MR. ELLIS: And, RJ, it's Mark again. You know, I think that Ed's suggestion is a good one because I think you need a vehicle now to get feedback from other people and there needs to be a way to summarize what happened today and then say, either recommend as sort of a stalking horse, you know, what

MSHA and NIOSH feel would be working groups that might be established, but ask the stakeholders for their input on that as well. You know, what should be the topics that the different working groups might address at the outset that would potentially serve as an agenda for each of those working groups to focus on those ideas.

MR. GREEN: Yeah. Ed Green again. Let me be very frank. I believe the objective of this partnership should be to see how we can proceed without developing regulations. We have a regulatory regime, and maybe it needs some tweaking, and I think what we ought to be doing in this partnership is to try to accomplish everything possible short of regulations, and that means that we have to also be responsive to MSHA's RFI.

I'm mindful of Roz's recitation of the comments received in response to the questions that MSHA raised and her comments about the two executive orders. We need to have something that MSHA as the regulatory agency can point to that says, well, here's the answer to our Request for Information. I think the deadline is, what? January 28 or something like that? And also something that NIOSH can point to as sort of a document that NIOSH can use to help it carry

out its research chores.

DR. MATETIC: Thank you, Ed. I think Sheila has a comment.

MS. McCONNELL: Ed, this is Sheila again. And I hear you and I want to, I guess I want to make sure that everyone understands that today's presentations were geared to looking at best practices within the current regulatory framework and, within that current regulatory framework, how can we improve miners' health. And I just want to enunciate that because there seems to be a lot of concerns vocalized by -- I mean, and true, a Request for Information is like a preliminary step at what agencies typically take in going down that path. But does that necessarily mean that's the case all the time? And so we should look at the RFI as a vehicle by which the stakeholders can submit information, data, cross-data, best practices that would allow us to help miners' health. Does that make sense?

MR. GREEN: Absolutely. Ed Green. Absolutely. I think that's what this is all about, Sheila.

MS. McCONNELL: Okay. But there seems to be a general concern and uncertainty, and I was thinking that today's presentation was geared to such that it

looks like we are looking within the framework that we currently have and how can we protect miners' health, and there's room for improvement even within this current regulatory framework.

MR. GREEN: No disagreement there either. But I think the key is to try to identify and get our arms around what is going on, and we've taken a pretty significant first step to see that.

MS. McCONNELL: And I think we're both on the same page, Ed, I really do. I think you and I are just, I don't think we're talking past one another.

MR. GREEN: I don't either, Sheila. It's a question of I think it would be -- I'll be happy to help this out, by the way, but I think it would be very useful for NIOSH and MSHA to put your collective heads together and, again, put pen to paper and come up with a roadmap, if you will, for going forward. That's what I mean by a memorandum.

MS. McCONNELL: Okay. And I don't disagree with you and I can't speak for NIOSH, but MSHA's willing to do that. But I just wanted to mention it.

DR. BUGARSKI: One more comment. You know, I mean, with all these discussions we have today --

DR. MATETIC: Can you hear Alex -- hold, Alex. Can you hear Alex, Ed and Mark?

MR. GREEN: Yes.

DR. BUGARSKI: With all discussions we had today and with analysis of data we did at NIOSH and at MSHA, it transpires to me that there is two sides of the industry, you know. And in the past, we had diesel, you know, partnerships with both, with coal side and with metal/non-metal. And I'm finding that, basically, we have hard time to reach part of the industry which has, actually, problems because there's small operations, stone mines, underground sand and gravel operations, and those are not -- I don't know, I'm trying to understand are they represented in this partnership at all. Who is reaching them and how we are going to hear from them? How we are going to learn about their problems? Because I have very good experience working with Newmont, Stillwater, and, you know, big companies, you know. But what might help, you know, with the DPM regulations with overexposures which are currently occurring is that we are not actually reaching all parts of the underground mining industry.

And, you know, I'm so desperate to find access to that part and how to help them because, you know, deeper analysis of exposure data will show you basically that most of the larger companies have their

ducks in a row. But a lot of overexposure is actually occurring in small operations, you know, and with no structure to the, you know, new industrial hygienists, mechanics and this kind of stuff. So we need also to focus on that part of industry because, if we want to eliminate overexposures, I think we should focus on that part of the industry.

MR. GREEN: Alex, Ed Green here. I couldn't agree more with you and I think it seems to me that part of the document that I'm talking about should be to identify that problem and try to sort out how NIOSH, MSHA, and the private sector partners can help figure that out. We're not going to get an anwser today, but I understand what your problem is.

DR. BUGARSKI: Yep.

DR. MATETIC: I think what everyone is saying here is once we're identifying the tracks that we all believe we need to move towards, then we need to get the right people in the partnership if they don't exist currently to make that happen. Is that what I'm hearing?

MS. McCONNELL: And that's a challenge in itself, getting the right people in the room.

DR. MATETIC: Right. And that is a challenge.

MS. McCONNELL: Right.

DR. MATETIC: Yes. He needs a microphone.

MR. NARDO: I don't need that. I think you can hear me.

DR. MATETIC: Okay. Very well.

MR. NARDO: My name is Dave Nardo. I'm going to represent the mining side of this. Since I wasn't at the first one -- have been equipped, not only metal and non-metal -- have you all established a --

DR. MATETIC: Dave, that was your name? I could hardly -- I got hearing loss too, so I could hardly hear you, but I'm assuming you were asking what lines of communication has been developed --

MR. NARDO: Right.

DR. MATETIC: -- to kind of like push this information out to -- and it's really the websites, correct me if I'm wrong --

MS. McCONNELL: Right.

DR. MATETIC: -- and, you know, who -- you have a distribution list.

MS. McCONNELL: Right. Yes, we did it by multiple avenues. We did it through our website, through our ListServ of people who have registered for out website. Plus, we had a particular email list of

industry people who are interested that we could send the communications out. So we tried all the means by which we usually communicate. We didn't do anything differently than we do when we want to reach out to the community and for other reasons. So we used the same vehicles that seemed to be successful in the past. Okay?

DR. MATETIC: By the way, you guys are doing very well. That door might open here soon.

(Laughter.)

DR. MATETIC: How about any other additional comments? Suggestions? Thoughts? Jessica?

DR. KOGEL: So this is Jessica Kogel from NIOSH. I'm not going to make any additional suggestions. I just wanted to say that, you know, following up with what Sheila said, you know, I hear loud and clear, I think both Ed and others, Mark as well, as well as actually everybody who's made comments here today, it's pretty clear what the next steps need to be. I think Sheila did a good job of articulating our challenges, NIOSH and MSHA, as far as taking that first stab at developing kind of what are the topic areas for these working groups. And I think I hear that we're all in agreement that that's how we need to go.

We need to develop this document that is going to come out of this meeting. And so I think the next steps need to be NIOSH and MSHA to get together, go through that process. But I think we are going to -- because Sheila spent a lot of time already struggling with this question, and so I think what we can commit to do is to come back to this group, and not just those here in the room but everybody who's collectively involved in this, and we might come up with a list that we'll throw out there of areas where we'll ask you to please come back to us and give us your comments on that or, in the meantime, because it's going to take us some time to get to that point, if you have any thoughts about logical ways that we can organize this to advance this partnership and what we're trying to do here, we would really, really appreciate it because I think we're going to end up spending, you know, a lot this time and thought about what that should be and we may not come up with the best answer. So please don't hesitate, if you don't have any comments today on it, come back and, Sheila, if people have thoughts and they want to come back to us --

MS. McCONNELL: Yes. They can --

DR. KOGEL: -- in the future, what's the

best way for that to happen?

MS. McCONNELL: The best way would be -- I think what we can do is they've already -- the best way is I think we'll just put a comment link to where they could send specific things on our website, a specific link to a mailbox. But in the meanwhile, they have access to my email address, and Roslyn Fontaine has also been emailing the community. So either way would be right now as an intermediate step to email either one of us. But then I think for moving forward, just of having a link to send comments, information out, you know, outside of this. So it's ongoing because the RFI will close and we'll need to move forward just to have a separate one. And that's what we'll do when we get back.

DR. MATETIC: And I'm assuming Mark and Ed and all on the phone heard all that, right?

MR. ELLIS: Yeah. I think we're good here.

DR. MATETIC: Okay. Joe has a -- Joe Sbaffani.

MR. SBAFFONI: Joe Sbaffani. Just an observation. It sure seems like a lot of the improvements that have taken place have been a result of cleaner engines. And I think it's imperative that you have the equipment manufacturers asking for

direction. They need to get that direction because that's one of the biggest issues that we've faced throughout our history. We don't explain to people where we want them to get to.

And I think we have the expertise in MSHA and NIOSH, but they need to get out of that mode of not knowing where they want to go. You know, it sure seemed to me like they were asking for some direction on where to go with the next design of cleaner engines. I think that's very important because it sure seems like all the improvement we've seen to this point is a result of cleaner engines.

MS. STIRLING: And can I respond to that question or comment?

DR. MATETIC: Sure.

MS. STIRLING: Again, this is Evelyn Stirling from Cummins, Inc. We know where we're going in terms of cleaner engines. We're always working to do that. We have the Tier 4 final. We're going into stage five in Europe, which will also be Tier 4, which is hopefully making a more simpler engine. It allows us to take some of the after-treatment off. It allows us to take the EGR system off and still meet Tier 4. So, you know, from a manufacturing standpoint, we're always working to improve the emissions of the engine.

But the frustration is understanding if, you know, MSHA are going to regulate to do that or not, because, currently, I'm also working to get a lot of the older product over Tier 3, not anything less than that, but Tier 3 and some Tier 4i and some engines which are basically Tier 4 but without the after-treatment approved in the system so they can be used to clean up older engines in there. So, yes, some of the improvements over time has made because of our emissions engines but also because miners have taken out some of the Tier 0, Tier 1 and maybe Tier 2 and put in Tier 3, which are repairable.

I mean, I heard a lot in the discussion about people saying, you know, with the integrated engines, it is very difficult to repair current equipment. But some of the Tier 3s, et cetera, can be used to repair Tier 0, Tier 1, Tier 2 engines. So I think some of the benefits out there and some of the reductions we see aren't necessarily being from using Tier 4 interim and Tier 4. It's just been using later emissions and more electronic emissions.

I mean, the cancer effects and what have you were made using some of the mechanical style engines, you know, so we're improving emissions all the time and we know the direction we're going to, but when it

comes to working to see what we need get certified for the underground mining market, you know, just tell me. I mean, I'll do all the certification for stage five when they become available or whatever.

I just don't want to invest in -- you know, I'm being asked all the time from OEMs or mines saying we would really like this Tier 3 product certified because now we want to use it. You know, so I'm investing in doing that work through MSHA, and, I mean, if that's not where people are going, then I don't want to do that investment. That's where my frustration is. I mean, it's not that I don't know where to develop the engines. We're doing that, and we're trying better and better to improve the emissions even beyond what EPA regulates.

DR. MATETIC: Thank you, Evelyn, for your comment.

Any other like operators, industry in the room that want to make a comment? Any other additional comments, either on the phone or in the room? If not, I'll allow you all to leave.

(No response.)

DR. MATETIC: Well, first of all, on behalf of NIOSH and a partner, a chair of the partnership, you know, I want to thank all of the speakers today.

I've been through a lot of partnerships and there is a lot of time put in to provide information to a group of people in industry, labor, government, what have you, that kind of advances the state of affairs. So I know the time that you put in to make that happen. And on behalf of the partnership, NIOSH and MSHA, I truly do appreciate that.

I want to thank your participation in this last session. I'll be honest with you, sitting back there, I was a little concerned. When I got up here, and I guess maybe my threatening behavior helped, but I'm very pleased that we actually went through this process and we have our to do's, and we will make sure we share them with the partners and the people that we have information for.

All of you on the phone, I want to thank you for your comments as well. I want to thank MSHA for hosting today here in Triadelphia. That's another thing that I understand how much time it takes to make sure that you got everything you need for people to come visit, listen and see information. So I appreciate that as well.

So now, unless anybody else has any other comments, Sheila? Jessica? You're free to go. So thank you for all your attention.

(Applause.)

(Whereupon, at 5:30 p.m., the meeting in the above-entitled matter adjourned.)

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REPORTER'S CERTIFICATE

DOCKET NO.: N/A

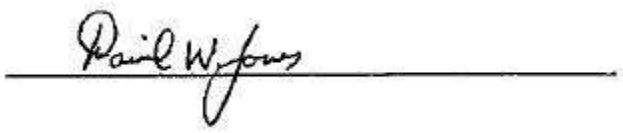
CASE TITLE: Diesel Exhaust Health Effects Partnership Meeting

DATE: September 19, 2017

LOCATION: Triadelphia, West Virginia

I hereby certify that the proceeding and evidence are contained fully and accurately on the tapes and notes reported by me at the hearing in the above case before the U.S. Department of Labor, Mine Safety & Health Administration.

Date: September 19, 2017



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