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Services

Centers for Disease Control and Prevention

National Institute for Occupational Safety and
Health

Mine Safety and Health Research Advisory
Committee

Meeting

Tuesday

June 2, 2020

The Advisory Committee met via Video
Teleconference, at 10:00 a.m. EDT, Jefferey Burgess,
Chair, presiding.

Present:

Jefferey Lloyd Burgess, University of Arizona,
Chair
Ronald Bowersox, United Mine Workers of
America
Thomas Harman, National Mining Association
Kramer Davis Luxbacher, Virginia Tech
Marifran Mattson, Purdue University
Michael J. Wright, United Steelworkers of
America
Kyle Zimmer, Jr., International Union of
Operating Engineers
William J. Francart, Mine Safety and Health
Administration, ex officio
Cagler Oskay, National Science Foundation, ex
officio

Also Present:

Jeffrey H. Welsh, Executive Secretary,
Designated Federal Officer
Jennica Bellanca, NIOSH Pittsburgh Mining
Research Division
John Howard, NIOSH Director
Jessica Kogel, NIOSH Associate Director for
Mining
Steven Mischler, NIOSH Pittsburgh Mining
Research Division
Gerald Poplin, NIOSH Spokane Mining
Research Division
Drew Potts, NIOSH Pittsburgh Mining Research
Division
Bob Randolph, NIOSH Pittsburgh Mining
Research Division
Bruce Watzman, National Mining Association,
Retired

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Proceedings

(10:01 a.m.)

Introduction, Announcements, Approval of Minutes

Mr. Welsh: Good morning. I'd like to welcome everyone to the spring MSHRAC meeting. I am Jeff Welsh, the DFO for MSHRAC.

We normally have a day and a half in person meeting for our spring meeting. But because of the COVID-19 pandemic we're having a half day virtual meeting instead.

I want to mention a couple of changes to our Committee since our last meeting. Priscilla Nelson's term had expired in December. And she has left the Committee. Marifran Mattson from Purdue has rejoined MSHRAC as a Committee Member. Richard Fragraszy just recently retired from NSF. And we're fortunate to have Cagler Oskay as an alternate that is filling in for NSF for today's meeting.

And the last item as far as the Committee, Jeff Burgess will be the MSHRAC Chair for this year.

Next I need to confirm that we do have a quorum. And that is eight Members. I'll do a roll call. And as I state your name please indicate if you are present. Ron Bowersox.

Member Bowersox: Here.

Mr. Welsh: Jeff Burgess.

Chair Burgess: Here.

Mr. Welsh: Dale Drysdale. Bill Francart.

Member Francart: Here.

Mr. Welsh: Tom Harman.

Member Harman: Here.

Mr. Welsh: Stacy Kramer. Kray Luxbacher.

Member Luxbacher: Here.

Mr. Welsh: Marifran Mattson.

Member Mattson: Here.

Mr. Welsh: Aubrey Miller. Cagler Oskay.

Member Oskay: Here.

Mr. Welsh: Mike Wright.

Member Wright: Here.

Mr. Welsh: Kyle Zimmer.

Member Zimmer: Here.

Mr. Welsh: We have nine members present. So, we do have a quorum, and this is an official meeting.

The last item I wanted to mention, is to remind all Committee Members, that if a conflict of interest comes up at any time during the meeting, please declare that conflict, and recuse yourself from any discussion or voting on that matter.

With that, I welcome everybody. I'll turn it over to our Chair, Jeff Burgess.

Chair Burgess: Good morning, everyone. Thank you for joining us today. So, the first item on the agenda is the approval of minutes. So, I hope everyone got a copy of those. So, I'd like to have a motion to consider these minutes for approval.

Member Zimmer: I make a motion to approve the minutes.

Chair Burgess: All right. Thank you, Kyle.

Member Bowersox: I will second that motion.

Chair Burgess: Great, thank you. Who was that? Ron?

Member Bowersox: Yes.

Chair Burgess: Great. Thank you. All right. Do we have any discussion on the minutes? All right. Not hearing any discussion we'll call the vote. All those in favor of approving the minutes please say aye.

(Chorus of aye.)

Chair Burgess: Those opposed, please say nay.

(No response.)

Chair Burgess: Okay. The minutes are approved. Thank you very much. So, we are a little ahead of schedule here. But I was wondering if John Howard was going to be able to join us today, and if he was on. Jeff, do you know if John will be able to join us today?

Mr. Welsh: Yes. John is planning on joining.

Chair Burgess: All right. I don't see John on, would you feel that it would be best to move forward with Jessica's presentation? Or should we wait a few minutes for John to join us?

Report from the Associate Director for Mining

All right. Not hearing from John right now, Jeff, I suggest that we go ahead and start with Jessica's presentation. And then when John comes on he can perhaps interrupt the presentation, and we can continue on afterwards. Does that sound acceptable to you?

Mr. Welsh: Yes, that's fine.

Chair Burgess: So, could we go ahead and start with Dr. Jessica Kogel's presentation, please?

Dr. Kogel: Thanks, Jeff. I only have ten minutes, so, I'm going to move a little bit quickly through this. But I know we are slightly ahead of schedule. So, maybe we'll have time for some questions.

I have four topics that I wanted to update the Committee on. And I'll begin with the NIOSH COVID-

19 response.

The overall goal is to provide science-based information to employees and employers about how to prevent the spread of the virus in the workplace.

On this slide you'll see two examples of guidance documents that are available from the CDC website. There are many, many documents on the CDC website and I invite you to visit the website frequently for up to date information that changes daily and continues to evolve as we understand more about the virus, and more about how to implement CDC guidelines in specific workplaces.

In addition to guidance documents we also provide industry specific resources that are tailored to specific workplaces, and even specific work situations in some cases.

These resources include fact sheets, of which there are two that have been cleared for mining that will be posted on the CDC website soon.

I'll also mention that yesterday a COVID-19 webpage for mining went up on the CDC website. It has some good information.

Another thing that we're doing as far as outreach, and supporting our stakeholders in all sectors, including in mining, is webinars.

These webinars are hosted by various stakeholder organizations. And we've already held one webinar with SME. And we're planning a second follow-up webinar with SME.

Two weeks ago I participated in a webinar with the International Union of Operating Engineers. And I'd like to thank Kyle for inviting me to participate as a panelist in that webinar.

We're also in discussion with IMA-NA and we're planning a webinar with them sometime in the very near future. And if there are any other organizations

who would like to have a webinar, we would be very interested in talking with you.

The format is typically a panel discussion. And it may include representatives from industry, labor, and Government.

We found that this format has proven to be effective. It's a way for NIOSH to quickly disseminate timely information. Webinars also provide a platform for stakeholders to share their best practices, steps that they are taking now for keeping the workplace safe.

Webinars also provide an opportunity for NIOSH to learn about the challenges that mine operators and workers are facing. And also what sorts of decisions they're making as they implement the CDC guidelines.

The focus has been on developing guidelines for two primary groups initially. The first is workers working in close proximity to one another. Examples include meat processing plants and cruise ships.

The second group is essential critical infrastructure workers. These are the workers who support the critical infrastructure needs, to ensure the continuity of the products, the services, and the functions that are needed to keep society running.

This includes workers who support crucial supply chains, which is where mining comes in. You'll notice if you look at the graphic that I'm displaying right now that mining is not shown as one of the 16 essential critical infrastructure sectors identified by the Department of Homeland Security.

But mining is at the base of the supply chain. And it provides all the essential raw materials for all the sectors listed here, even including agriculture. Because mining provides fertilizer.

So, mining shows up in many, if not all of these sectors. Coal mining is listed under the the energy sector. If you look at the critical manufacturing sector

you'll find metal/nonmetal mining.

So, as a result, mining operations have continued at some level throughout the pandemic, with some mines shutting down temporarily because of positive cases, or because of low demand. With the pandemic we've seen markets hit very hard. And so, that has also flowed through to mines. Frac sands is an example of that, as well as others.

So, that's really all I have time for, as far as my comments about COVID-19. So, I want to move on.

Mr. Welsh: Jessica.

Dr. Kogel: Yes.

Mr. Welsh: I see John Howard has joined. Let's move to his presentation.

Dr. Kogel: Yes.

Mr. Welsh: John.

Dr. Howard: Can you hear me?

Mr. Welsh: Yes.

NIOSH Director's Opening Remarks

Dr. Howard: Okay. Thank you. So, yes, thank you, Jessica. I think you did a great job on COVID-19, which is of course all I've been doing.

Obviously the first, the second and third quarters of FY20 have been very difficult for us. We actually have money that we have not used, as you could imagine. We're not traveling. And we have about a \$5 million dollar travel budget.

And so, we're beginning to use some of that budget excess for stimulating research projects in COVID-19. We've also received about \$20 million dollars from COVID funding going through CDC for various activities that we support in this area.

I think there are probably three that fit into some of

the presentation that Jessica did. The first are really field investigations. We have been doing about 20 site visits in various states for beef, and pork, and chicken processing, a very significant congregant working situation, with a lot of cases popping up.

We've also been engaged in doing surveillance of cases and fatalities by occupation and industry, chiefly starting with healthcare workers, but also branching out into meat and processing workers.

We've also done field investigations in nursing homes, and long term care facilities, and prisons, other examples of conjugate living situations.

Probably our biggest activity, which I think everybody may be aware of already, is the respiratory protection recommendations that we've done in response to the crisis shortages of N-95 respirators in healthcare.

So, we have a lot of recommendations about optimizing the supply of N-95s. Also using alternatives to N-95s, such as elastomeric respirators, or powered air purifying respirators.

April 14th we did an interim final rule on PAPRs, that decreased their weight, and increased some of their performance criteria for use in healthcare.

We've also done recommendations on using stockpiled respirators that are beyond their shelf life. Many in the national stockpile fitted that category.

We've also been doing a lot of approvals, both from domestic manufacturers, and also respirators made by international manufacturers, which, some of which comply with international standards, EU standards. Or some that don't, as well as discovering a lot counterfeit and fraudulent labeling of respirators.

Perhaps one of the more controversial recommendations that we did as a crisis strategy is the decontamination and reuse of N-95 respirators,

primarily through three mechanisms, vaporous hydrogen peroxide, heat and humidity, and ultraviolet germicidal radiation.

We also have a PPE burn rate calculator, which is now an app on Android and the Apple site, which helps hospitals manage the shortage of their respirators.

So, a lot of activity around COVID, as you can imagine. It is the whole Government approach. We work in the Emergency Operations Center of CDC, which is part of the National Response Coordination Center, the NRCC, which FEMA runs.

And that reports to the Corona Virus Task Force at the White House. So, it's a very unified type approach.

I'll just end with, you know, some future oriented things. You know, we're obviously awaiting therapeutics that may be developed, that will help folks who develop COVID-19 get well quicker, and avoid fatalities.

We're also awaiting all of the vaccine research that's going on, which is accelerated significantly. We're also looking at worker testing strategies.

CDC has done guidance for testing of workers in nursing homes, for instance, a weekly testing, viral testing. And we're beginning to look at issues related to other types of worker viral testing.

As we approach the summer and the fall we're going to find out if there's a seasonality effect, which many people have talked about, and reflects the 1918 influenza pandemic.

And I think the last issue that's going to occupy a lot of our time after the reopening, and the reestablishment of a lot of workplaces occurs here over the next couple of months, is managing case contacts that pop up in workplaces, and also case spikes in certain regions and areas of the country, and how to handle that.

So, I'm going to stop there, and see if Jeff, if there's any questions from folks, or anything.

Chair Burgess: Thank you, John. We appreciate the presentation. Does anyone have any questions for Dr. Howard? All right. Not hearing any questions, John, thank you very much for your presentation. We appreciate that you could join us today.

Dr. Howard: Well, thank you, Jeff. And thank all of you for the time that you're putting into MSHRAC. It's very important to us. So, thank you. Have a great meeting.

Chair Burgess: Great. Thank you. Take care, John. All right. With that, let's go ahead and go back to Dr. Kogel's presentation.

Report from the Associate Director for Mining
(continued)

Dr. Kogel: Thank you, Jeff. So, from what you just heard from Dr. Howard, you can see that we've been very, very much engaged in COVID-19. It's really dominated our attention on many levels.

NIOSH, CDC, and HHS have been heavily focused on COVID-19 since February. And our regular business has continued as well. And so the remainder of my presentation will focus on some of the things that have taken place since the last MSHRAC meeting.

I am pleased to say that on April 29th the HHS Secretary approved the Mining Program Reorganization Package. As you all know, this was a two-year process in total.

So, after the approval by the Secretary, Congress was notified. And then there was a notice published in the Federal Register. And that happened on May 20th.

Right now, we expect to stand up the new organization on October 1st, 2020, which is the beginning of the new Fiscal Year. So, that's the

current plan. And I think we should be able to do that.

As a reminder to the Committee the new organization will consist of five branches, and 16 teams across the two divisions.

Each division will have a miner health branch, and a mine safety branch. And then the fifth branch, which is the human systems integration branch, will support both divisions. And you can see that on this slide, that that branch has a dotted line report to SMRD, and a solid line report to PMRD.

Within this branch there will be five teams. And these five teams will provide crosscutting research and support services to the entire mining program. Some examples include health communications, human factors research, surveillance and statistical services, and statistics research.

So, the next slide moves on to another topic that I wanted to update you on. And that's recent activities that have taken place around mine automation and emerging technologies, health and safety research.

Since the last MSHRAC meeting NIOSH has continued down the path of building a robust research strategy to understand the health and safety implications that are associated with the implementation of mine automation and emerging technologies in mining.

Just as a reminder, our guiding philosophy for developing this strategy has been to make sure that it is stakeholder driven, that it's miner centric, that the emphasis will be on human factors, not particularly on technology development. And that we will approach this from a global perspective.

Some recent activities of note that I would like to update you on include the three items shown here on the slide. NIOSH established the Mine Automation and Emerging Technologies Health and Safety Partnership in January. The first meeting of this partnership was held in May. And the purpose of that meeting was primarily to plan a workshop for the fall.

NIOSH also has prepared a response to the Metal Mining Automation and Advanced Technologies Workgroup recommendations, which has been distributed to the Committee. So, hopefully everybody's had a chance to look at that.

The third thing that I want to mention is that NIOSH benchmarked progress against recommendations that were made in the Mine of the Future Report, which was published in 2017.

And just as a reminder to the Committee, this was a report that I think most everybody on the Committee will recall. Jeff Welsh had responsibility for developing that report. And he made several presentations to the MSHRAC Committee.

It was an internal document that was written by several SMEs within the program. And then it was reviewed by other subject matter experts both within NIOSH as well as outside of NIOSH.

The report made 15 specific recommendations for systematically building a research program to address occupational safety and health as it relates to mine automation.

And so, this next slide shows the result of that benchmarking. And as you can see, of the 15 recommendations 87 percent have been completed, or are in progress. And two of those, which is 13 percent, have not been started yet.

I wanted to share this to remind everybody that this has been a very strategic process. We've taken in a lot of information from different sources. And this provides an overview of the progress that we have made over the past several years.

So, the last topic that I want to talk about is the Respirable Mine Dust Partnership. And I have a couple of slides on this.

Three milestones have been reached. One is that we developed a charter for the Respirable Mine Dust

Partnership that was shared with the Partnership.

The first Partnership meeting was held in February, in Washington, DC. We had over 110 attendees both in person, as well as on the phone. One of the things that came out of that meeting, besides reviewing the charter, was also a commitment to planning a workshop on respirable crystalline silica. This workshop will take place in the fall on October 21st and 22nd.

Originally, we had hoped to have this as an in person meeting. The Committee that's charged with developing the agenda and putting on this workshop met last week. Out of prudence and caution the committee made the decision that this would not be an in-person meeting but instead it would be remote, via Zoom, or some other platform.

And so, that also meant that we needed to change the workshop format. Originally it was planned for a day and a half and was going to be very comprehensive. And it still will be comprehensive. But we didn't think people would want to sit in front of their computers for a day and a half.

So now it's a slightly shortened agenda. And it will be held on two back to back days. And I believe it's three hours for each of those days, or six hours total.

We have all participated in a lot of Zoom meetings, including this one. And they have been a good way for interacting so I think this will be a very successful workshop.

The agenda is under development by the committee. The Committee is made up of two Members representing labor, two Committee Members representing industry, and then NIOSH and MSHA are on the Committee as well.

At the last MSHRAC meeting we had a lot of discussion about respirable crystalline silica.

At that time one of the requests that came out of that

discussion was that the next MSHRAC meeting, which is this meeting, would focus on respirable crystalline silica.

We have presentations on respirable crystalline silica today. But we felt that we could do this topic more justice by having this October workshop, and inviting the MSHRAC Committee to that workshop. So, the next couple of slides are in response to our discussion at the last MSHRAC Meeting and are very high level. They provide an overview of the extent and scope of respirable crystalline silica research at NIOSH, across the entire institute.

Respirable Crystalline Silica research constitutes a large portion of the NIOSH research portfolio. Currently there are 38 active respirable mine dust projects. Fifty-eight percent of these address respirable crystalline silica specifically.

This research spans the spectrum from surveillance to exposure assessment, and then to intervention, primarily in terms of engineering controls. But other interventions as well.

And in the bottom right hand box there I list some of the products that have come out of this research. It ranges from surveillance data, monitoring devices, to control technologies. We have also published best practices and guidelines, and developed new analytical methods.

And I should mention, with monitoring devices, the focus now is on person wearable real time monitoring devices. So, we're focusing in that area for respirable crystalline silica as well.

We will share a lot more information today during our presentations. But also, in October when we have the longer format workshop, where we can get into more detail.

So, just to give you a flavor for work that is occurring across the institute, this slide provides a snapshot of the locations where this research is taking place

within NIOSH.

In addition to work being done within NIOSH intramurally, NIOSH also funds many partners throughout the U.S., who are also doing work in this area. So, there's really a significant effort here.

And this slide shows the location of our current extramural partners. The gray boxes are the universities that are currently funded through NIOSH, both through the NIOSH Office of Extramural Programs, and the Miner Act Contracts and Grants Program.

And then two private sector companies are funded through these programs as well, working on respirable crystalline silica.

So, that concludes my presentation. Except there was one thing before I move on to questions that I wanted to mention. I wanted to give the Committee an update on where we are with our Lake Lynn replacement.

You will recall that we have shared with you information about a site in West Virginia, the Mace site. And I'm pleased to announce that the landowner has accepted the Government's offer.

However, the sale is contingent on the successful completion of the final Environmental Impact Statement, and a resolution of any environmental issues that may be identified as a result of that EIS.

So, that's very good news. It's been a long time in coming. And it's just good to see that we're continuing to move down the track with that.

So, with that I'm happy to answer any questions that people may have.

Chair Burgess: Thank you, Jessica. Does anyone have any questions for Dr. Kogel? All right. Again, not hearing anything, we will have time at the end of the meeting as well too for questions.

So, Bob, if you could hand over the meeting to me, so I could share my screen? Here we go.

Mr. Welsh: Jeff, I wanted to mention that we did get a question in the chat area from the public.

We do have a public comment period towards the end of the meeting. Questions from the public will be answered at that time.

Health Advisory in the Mining Program Workgroup Finalize Workgroup Report

Chair Burgess: Great. Thank you, Jeff. So, we'll move forward to our next agenda item, which was a final report for the Health Advisory in the Mining Program, HAMP Workgroup.

So, this meeting took place last fall. And we discussed it at the previous MSHRAC meeting. At that point it was asked that we provide just an update on the report, which has been finalized.

So, I'm going to go through that fairly quickly today. And then we'll have a presentation following this by Dr. Jerry Poplin that will address some of the recommendations that were brought up during the workgroup.

So, I wanted to thank everyone in the working group. In addition to myself that included Kyle Zimmer, Kelly Bailey, and Aubrey Miller, who all participated in helping to moderate the actual workgroup that was held at the University of Washington facility.

And also, Jacob Rukavina, Ron Bowersox, Kray Luxbacher, and Marifran Mattson, who all helped organize the meeting.

The three charges that we were given to address during the meeting included the following. First, what gaps exist in miner health research? Second, what mechanisms can be established to improve communication of and participation in occupational

health research by our industry partners and labor partners?

And third, how should the miner health program be evaluated? And as part of that there was a question of what measures and methods will indicate successful improvement.

This information was presented during the last meeting. So, I'll go through it fairly quickly. But for the first question, what gaps exist in miner health research, we took all of the different topics that were discussed.

And then we had a voting at the end of the meeting. So, you can get an idea of the importance of each of the topics, from the top down to the bottom. And you can see that silica was, as we are discussing today, was the most important topic from a health perspective, based on work, the workgroup voting.

After that came surveillance, then health and well-being, followed by hazard exposure monitoring and assessment, and then health economics.

These were some of the individual topics, again that you can see that came up, in addition to the voting, the previous totals. And again, you can see silicosis here, based on information on worker health. And then also, the importance of fitness for duty evaluations.

For the second question, what mechanisms can be established to improve communication of and participation in occupational health research. In terms of number of topics the most important issues were to establish more partnerships, to be able to share more effectively, including through case studies.

Also we had a number of topics on financial aspects. And then a larger grab bag of other. And here you can again see a large number of individual topics that came up based on this.

And we will summarize those at the end of the presentation.

And finally, for the final question, how should the Miner Health Program be evaluated? What methods and measurements will indicate successful improvement?

The best mechanisms as determined by the working group were surveys to, using surveys to get information, counting the number of partnerships, being able to collect information on outcome measures, including costs and exposures. And then again, another grab bag category of other.

Here's some of the individual topics that came up in terms of being able to collect outcome data and communication. And so I'm going to move, again, the slides I just showed you were already presented. So, this is new since the last time.

We were asked to summarize the information in the form of an executive summary, so that the recommendations would be clearer to NIOSH. And we had discussed these topics during the last MSHRAC meeting.

And so, they're laid out as they were discussed during the last meeting, and with some additional input that we received between that meeting and this meeting.

So in summary, the gaps in research were felt to include behavioral health and substance abuse. A particular point here was the need to evaluate the effectiveness of intervention programs.

And I would daresay that this is not specific just to mining. But I would say for all of NIOSH and all occupational groups. I think this is a very important topic.

The next one was heat exposure, with particular focus on deep mines, but also on surface operations in warm climates. Again, we have a number of those throughout the United States, as well as elsewhere in

the world, of course.

A third topic was surveillance of health outcomes. In addition to active miners there was great interest in surveillance of retirees. Because I think as we all know the number of diseases that occur from occupational exposures while at work.

Also, there was a focus on helping treating physicians recognize occupational diseases. And one primary example was silicosis.

As Jessica mentioned silicosis was a major focus area of our discussions. And there was a request that it should be the subject for our next MSHRAC meeting. So, we are covering those topics today. But as she, as Jessica said, there will also be a separate workgroup on that.

Additional topics included the toxicity of welding exposures and controls. I think that was particular to this meeting, as compared to some of the other meetings that NIOSH had had to collect information on the Miner Health Program. And also, the important category of fitness for duty.

I would say that these gaps in research were particular to this meeting. And NIOSH should take into account all the other meetings they've had for the HAMP program, to help decide their larger research endeavors. So, this list should be added to the previous list that had been generated.

The summary points for communication, whether NIOSH should continue to seek additional partnerships. NIOSH should find ways to share best practices.

One way that it was felt that this could be effectively done was to generate and share case studies. Those tended to be well received in general by the workshop participants.

And then, as previously mentioned there, it would be helpful to have an evaluation of economic outcomes

of programs. That would be an important part of determining the effectiveness of any programs that were put in place.

And finally, the summary of evaluation. It was felt that the effectiveness of the NIOSH Miner Health Program should be measured based on the number of partners and partnerships, as you saw on the previous slide. And through the use of surveys and outcome measurements whenever available.

So, we realize again that there are limitations to the available databases that are out there, such as the MSHA databases. They're good for injuries, perhaps a little bit less so for health.

But again, it should be important to use, it would be important to use not just those existing databases, but to consider being able to collect additional data on these outcomes from industry and labor partners.

And with that, that's the end of my presentation. I'll stop sharing. And I'm happy to take any questions from the group.

Member Zimmer: Jeff, this is Kyle. I just want to thank you for your leadership on this Subcommittee. You've done a wonderful job, and kept everything moving in the right direction.

I just notice that there was a question submitted regarding suicide, the increased rates of suicide. Will that be added to the work that this Committee's doing?

I think I kind of addressed that during the workshop in saying that the, you know, along with the substance misuse issues, and behavior health issues, suicide is becoming very prevalent, both in the construction industry and in the mining industry.

So again, we need to continue addressing those issues. We're seeing a big rise right now with the state of affairs with the COVID crisis, with the state of affairs civilly in the country.

People are stressed to the max. And it's just pouring over into the workplace in all areas. And I think Mike and Ron will agree with me that this has been a big issue. And, you know, we're trying to wrap our head around it now.

Chair Burgess: Thank you, Kyle. I agree. That's a very important point. And it should be considered in the broader category of substance abuse, behavioral health, depression, suicide. So, these are all very important topics. And I agree they need to be a focus area for NIOSH. Any additional comments or questions?

Member Bowersox: This is Ron. I just agree 100 percent on the suicide issue. That's a very, very critical situation in the workplace.

Member Wright: Yes. This is Mike Wright. We do too. We've seen really an increase across the board, not just in mining. And in deaths from overdose.

And one of the things we've learned in trying to address it is, you cannot focus only on the worker. You've got to really focus on the whole family. It's a family phenomena not an individual phenomena.

Chair Burgess: In that regard I'll point out that during the workshop we had a presentation from NIOSH about total worker health. And I think taking into account not just situation at work, but also situations at home, and how the two affect each other is a critical point that follows along with Mike's comment.

Does anyone else have any additional comments or questions? All right. Not hearing any, thank you very much. I appreciate the opportunity to present the outcome of the workgroup. And we'll go ahead and move on to Dr. Jerry Poplin's presentation.

Mr. Randolph: Okay, Jerry, it's ready for you to take control.

NIOSH Miner Health Program Strategic Plan

Dr. Poplin: All right, Bob. Just real quick mic check to see if you can hear me all right?

Mr. Randolph: Yes, yes. We can hear you.

Dr. Poplin: All right. Thanks. Just give it a second for the controls to come over. Okay. Looks good.

All right. Hello, everybody. Thanks, Jeff, for leading me into this talk. I think the last time I gave an update to MSHRAC was about a year and a half ago in Tucson. And the title for that presentation was Creatively Engaging in the Miner Health Program.

For those that were there you recall me taking a minute at the beginning of the talk, there was some handshakes, and greeting between each of the Committee Members and myself, to consider yourselves engaged.

So clearly times have changed. And given our current communication mediums, but still, I just want to wish everyone a warm welcome, hope that everyone is staying safe.

What I'm hoping to cover today is a brief snapshot of the last year and a half. And to highlight a few items that Dr. Burgess just reviewed with respect to MSHRAC's facilitation of that Seattle workshop for Miner Health, and the subsequent report that they provided NIOSH.

All this interaction has helped inform a generation of specific strategic goals and activities that the Miner Health Program is anticipating pursuing. So, I'll be giving you a sneak peek of that, and what we envision is on the horizon.

In the interest of time I purposely won't be getting overly detailed. But we should have time at the end of my talk, and obviously at the end of today for any additional discussions.

So, since December 2018 we developed a draft

strategic plan for the Miner Health Program. That plan you recall was sent out to a handful of stakeholders, in addition to Committee Members in the workshop on Miner Health that Jeff, Kyle, and Aubrey kindly orchestrated. And that, with an additional piece of work by Kelly Bailey.

So, thank you all very much for your time and your efforts with that, and for producing the complimentary summary report, which was shared with us at the beginning of this year, which believe it or not was actually six months ago. So, time is passing us by.

Dr. Burgess just reviewed this during the last presentation. There are three questions that we asked the HAMP Workgroup to help us gain some clarity on, particularly from a cross section of mining stakeholders.

So, the intention being that establishing a stronger foundation in the Miner Health Program will give us the best chance of ensuring that the research we actually conduct is effective, is transparent, and also responsive to some of the evolving needs.

Not directly reflected in that report, here's some anonymized thoughts shared with me that I thought were worth sharing with this group, if only to emphasize that we will always be looking for open feedback from our stakeholders.

It really does provide us with a good barometer for whether or not we're reaching the right message with people, and also achieving some mutual understanding. So, we take feedback like this, and we adjust our approach wherever it's feasible.

So, I can't promise that I will deliver any decent solution on this first quote. But I want to highlight a few other points. Hopefully you'll see with our research goals and activities that I'll be presenting that the second and third quotes are addressed by an integrated approach to understanding worker health using methods from epidemiology, from occupational

medicine, industrial hygiene, psychology, and engineering.

And while we don't anticipate saving the mining world in the next ten years, I did find it actually most interesting that someone recognized that mining could benefit from some focused projects in this area.

These last two statements are also important to emphasize. We're not just looking for problems. The Miner Health Program can be a mechanism to highlight, reinforce, disseminate what is working well in industry.

And we hope that engaging with this Committee, and establishing a broader community partnership will help create opportunities to study these successful areas.

And lastly, we're keenly aware of the diversity within the mining community. And we really do hope to tailor our research accordingly, so that we can characterize miner health in new meaningful ways.

So, this is a quote from one of my favorite exchanges in a documentary, that I think we can all appreciate right now. But the context here is, health in any context is complicated.

This plan attempts to focus our activities, and to help simplify an otherwise complex mission. So, the Miner Health Program agenda describes part of that process.

So, if you didn't just pick up on what I said, I'm now calling this work product an agenda. Prior to today you've heard me and Dr. Kogel talk about developing a strategic plan. So, what's all with the agenda talk?

Part of it is semantics. While other parts relate to some of the bureaucratic silliness that was mentioned in one of the earlier quotes.

The take home message here is, in the end we will be producing and publishing an agenda that presents

a plan, which is strategic in nature. So, the mission as always is to improve worker well-being for the entire mining population.

Now, please keep in mind that the goals and activities I'll be presenting are broad, but specific enough to address over the next decade, which in Government time, much like geological time, is just a blink of the eye.

So, I will just say it's very good that we have geologists working within NIOSH, and also leading this mining group.

For those not aware, or need a friendly reminder, the Miner Health Program has three core functions, research, evaluation, and community engagement.

So, we've been talking about this plan and agenda for the last two years. It wasn't until the last fall's workshop that I came to appreciate how most individuals outside our institute aren't too interested in learning the nitty gritty details of evaluation and community engagement.

You like that we're doing it. You appreciate to participate in it. But definitely you just want to hear more about the research. So, I definitely get that.

Now, evaluation and community engagement are very much an essential functional component internally. So, I'll save you from the nitty gritty details. But we're not exactly going to escape them.

I'm going to present some higher level goals for these two functions, and make sure that everyone can appreciate how integral they are to the success of the program and its transparency. But I'm also going to give a little bit more time to focus on the research goals and activities.

So, last fall we asked how workshop participants felt the Miner Health Program should be evaluated. What measurements would be useful indicators of success for it, or improvement?

This is going to help ensure that we build these into our methods going forward, and provide a needed layer of efficiency to all of our program and project activities.

The executive summary report that Dr. Burgess provided summarizes this question pretty nicely, with establishing partnerships and surveying these partners about the intended outcomes of our research, and measuring the impact that our research has once it's completed and back in the applied world of the mining industry.

So, as a new program the primary goal is to simply build our capacity to prospectively evaluate what we do. If you've looked at some of the program evaluation summaries that Dr. Amia Downes and others at NIOSH have completed, you'll appreciate that evaluation when done right is a science of its own.

And in my experiences both in academia and Government I've seen evaluation largely underutilized. So, it's our intent to have evaluation in our program foundation by basically hiring people with these specific skillsets.

We also want to further delineate a systematic approach for assessing Miner Health Program activities. And then we'll be measuring and communicating our effectiveness through methodologies like a process and the impact evaluations that Dr. Downes has previously reported on with other programs within the mining divisions.

When discussing community engagement we've basically asked, what are effective ways to elicit participation in all facets of our research?

The research is meant to improve the health and safety of the mine worker. And often, if not always, that research is far better when workers and organizations are directly involved in that process.

So, you'll see a common thread here between

community engagement and evaluation, in that the workshop attendees wanted us to seek more formal partnerships, in order to create these opportunities to collaborate, or at a minimum share best practices.

We certainly agree with that sentiment. And we drafted our primary goal for engagement here to work collaboratively with mining stakeholders to address issues affecting the well-being of miners by building trust, enlisting new resources and partners, and improving communications to promote the exchange of ideas and best practices.

So, not surprisingly we're planning on doing this by developing partnerships in collaborations with community stakeholders, which I'll again mention later on. We also plan on building a strategic expertise within health communications.

One of the lessons I've learned in talking with folks from the Total Worker Health Program is that a large part of their recent growth and success can be directly attributed to their focused communication efforts. And just like an evaluation there's trained expertise in this field that we intend on leveraging.

And then lastly, we actually need to improve the internal coordination with other NIOSH programs and researchers, regarding studies relevant to miner health.

Bottom line here, I hope everyone can start to see that the underlying motivator with these activities is to cultivate trust. I believe it was one of the union representatives at an earlier National Academy's meeting who said, communication is both a problem and a solution. And honestly, we could not agree more.

So, the big question for the agenda is very simple. What gaps exist in miner health research? So, we've been asking this of our stakeholders in one form or another since Dr. Kogel began exploring this initiative over three years ago.

And at the Seattle workshop it turned into a very fruitful conversation, with attendees identifying 36 research topics and ideas that were reviewed.

And Dr. Burgess mentioned there were categories into five major groups. And then they summarized that in the HAMP report that was provided to us. And here some of those topics are listed in no particular order.

So, from a strategic goal standpoint the research under the Miner Health Program will conduct etiologic, surveillance, exposure, and intervention research that advances protection from work related health hazards, and improves the overall well-being of mine workers.

If we look at this, all right, if you look at this from the viewpoint of an epidemiologist, which I suspect everyone has become keenly aware of these last few months, one of the fundamental tools that we learn on day one is that triad, or triangle.

So, this is a model for explaining the connection between the cause of a disease or injury, and the conditions that allow it to spread. This is basically the who, what, where of any research question.

The who is the host, or the person or group whose condition and intrinsic factors are evaluated. Well, what is the agent, or the cause of the injury or illness?

But keep in mind that the presence of an agent alone is not sufficient for disease or injury to occur. Time, dose, pathogenicity also matter.

And then the, where is the environment, or the extrinsic factors that affect the agent and the opportunity for exposure. So, under this basic framework we have two intermediate goals.

The first is to better understand the health experience of miners, and investigate factors that influence worker well-being. So, what does this look

like?

Fundamental, and the backbone of the Miner Health Program is to systematically measure and compare health outcomes and exposures, which are leading indicators of health over time and to other occupational groups.

To steal a line from one of our researchers, you can't manage what you don't measure.

You obviously can in reality, but it would be far more subjective. Our goal here is to be objective and empirical wherever possible.

And I also just want to note that this particular effort is currently underway.

It's led by Dr. Aaron Sussell, and it's our intent to have this continue and evolve in perpetuity. Next, we will conduct studies on conditions that affect readiness for work.

Now, in the workshop report, that HAMP workgroup identified quote, fitness for duty, as a key research gap.

Here, I'm using readiness for work as an expanded understanding of that concept, which my previous experience has tended to be overly focused on physiological things.

You're aware of our current research looking into the cognitive effects of heat exposure.

We're continuing that, as well as developing a tool kit of sorts in fatigue management.

NIOSH and the Mining Program have had a large history of research focused on musculoskeletal disorders and injuries, which we'll continue, while mental health and substance use and misuse is a growing area of research within NIOSH that we actually are intending to explore and collaborate.

So, silica was not surprisingly one of the more vocal

topics of interest from the workshop attendees.

I believe it was Ed Green recognizing that research in the health effects of silica and other forms of dust exposure have been going on for the last three plus decades.

It will continue to progress under the Miner Health Program, alongside other researchers, the Mining Program, NIOSH, the greater NIOSH, particularly Respiratory Health Division and HELD, as well as our external stakeholder groups.

Drew Potts will be giving an update to the respirable crystalline silica research in the mining after the East Coast lunch break.

So, I'm not going to steal too much thunder on that thought.

One thing I did want to note is that respiratory health has been a fundamental research area of NIOSH since its inception.

Continued interest of its status from our stakeholders highlight its continued importance.

And just to reemphasize an earlier point I made on community engagement and health communication, I believe there's an opportunity within the Miner Health Program to better coordinate our communications with all that is going on in this particular area of research.

Another area of research activity is to understand different organizational structures and what factors are associated with commitment to proactive safety and health strategies, how those strategies impact worker well-being.

Dr. Emily Haas and other researchers out of our Human Factors branch in Pittsburgh have been looking at these types of questions for the last few years, and their findings help address part of one of the earlier critiques I mentioned about identifying

workplaces that are already doing things well.

Knowing what successful programs look like is something we're all interested in learning more about and something for us to demonstrate and evaluate through our science.

Dr. Haas's research is also proving to be an early unanticipated beneficial aspect to an activity that falls under the second intermediate goal for the Miner Health Program, and that is to evaluate new and emerging health hazards and sentinel events.

So, what exactly does this look like?

As very simple examples, we've talked about it already, but the two most significant emerging health threats and hazards to mining, as well as other industries, since I started at NIOSH three and a half years ago, are the opioid epidemic and SARS-CoV-2 pandemic.

Now, when a smaller group of us met at the National Academies a few years ago, some expressed this conflict of both curiosity and concern around studying HELD's clear influence in and out of the workplace, and its role in performance, productivity, and safety.

Since the pandemic came to the forefront of our everyday life, several industry groups and individuals have reached out to NIOSH asking questions like, we're essential workers, which many states have designated mining.

How can I do my job safely while maintaining social distancing practices?

How do I keep from bringing COVID home to my family?

How do I ensure I don't bring COVID to work to my fellow employees?

What does the organization have to put in place to minimize these new risks and still maintain the same level of safety from other known hazards?

These are really good questions and appropriate questions to be asking, and we definitely have our role to play here.

The interdisciplinary skills and the scientific objectivity that we intend for the Miner Health Program is unfortunately best exemplified in response to the current pandemic, but hopefully everyone can also appreciate its importance in addressing the non-emergent health matters, but I've also highlighted in this talk.

And for those that haven't already -- and Dr. Kogel and Dr. Howard highlighted it -- I would encourage you to visit NIOSH and the CDC websites to learn more about CDC's guidance for Critical Infrastructure Sector Response Planning. You can learn more about maintaining healthy business operations, establishing and revising plans to reduce spread, and maintaining a healthy work environment.

And then also keep in mind that as Dr. Kogel mentioned, these and other guidance materials are regularly updated as we learn more about the evolving pandemic, so it's always a good practice to visit these sites with some regularity to find out what the latest news is.

So, all this that I've been talking about with respect to the evaluation of the Miner Health Program, community engagement, and the research driving our mission, it's being worked into a formal agenda that is on my plate to complete in the next couple months.

But I want to highlight a few other things that we're currently pursuing this year.

It's our goal to establish a formal partnership in Miner Health to continue the progress that we've made these last couple years, and to bring about some improved communication structure and improve the potential for collaborations, participation in webinars and other such outreach mechanisms that were mentioned earlier.

You can also expect to hear more from me on this topic as it develops, but we do want to encourage you to reach out to us if there's interest within your groups to provide any updates on what we're learning from our research.

On the evaluation front, the Miner Health Program is one of five programs to participate in a new evaluation capacity building plan led out of NIOSH's office of the director, Dr. Downes, who you've had present several mining program evaluation efforts, is leading this initiative, and we've been lucky enough to have her expertise.

New to us as well is our participation as a host site here in Spokane for a CDC Evaluation Fellowship Program.

We're fortunate enough to match with what turned out to be a very impressive pool of candidates.

It's going to be a two year fellowship that begins this August, so we're definitely excited to be a part of that effort, as well.

Finally, and I hinted at this earlier with respect to silica and the respiratory health research, but we're making a concerted effort to develop and improve strategies to communicate our ongoing research.

I talked about this in another lecture on Miner Health Program, but I think it's worth reiterating that conducting health-related research obviously is not new to NIOSH or the Mining Program.

However, the Miner Health Program has an opportunity to structure a research program in a health-centric manner.

And to draw a brief connection to a previous job I had, I work at a fairly renowned biomechanics research center that studied and designed solutions to prevent and mitigate various injuries.

Aside from a couple of part-time positions and a

statistician, I was pretty much the only public health person amongst a sea of about 60 engineers.

All of our research was appropriately centered around engineering type questions, while the public health and the epidemiologic questions were a little bit more ancillary in nature, never really comprehensively studied.

Here with the Miner Health Program, we have an opportunity to formulate health-centered research questions in a cohesive and coordinated manner that complements our safety-based research.

And the integration of health communications in our program will hopefully bring our research to our stakeholders in an equally coordinated manner.

So, visually, this is the basic plan for what remains this year.

Again, I anticipate finalizing the agenda the next couple of months, and hopefully I'll have it publicly available by summer's end in one medium or another.

Meanwhile, as Dr. Howard mentioned, we, that is NIOSH, will undoubtedly continue to play a role in the pandemic response activities.

So far, about 25 percent of NIOSH employees have been deployed to COVID-19 response activities, and that's either in a virtual capacity or out in the field.

I see no reason not to expect that to continue.

As the year progresses, we'll continue to develop our communication strategies, and most notably, establish some form of a formal partnership in miner health.

And I'm sure this list is incomplete, but I just wanted to recognize that the development of the agenda and a strategic plan has involved input from many individuals internal and external to NIOSH.

Thank you everyone who has engaged with us thus far.

And again, a special thanks to Jeff, Kyle, Aubrey, and Kelly for facilitating that workshop and providing us with that summary report.

And now that I see that I've listed the 2020 partnership in Miner Health on three consecutive slides, my apologies for shoving that down everyone's throat, but I'm still happy to list it for your continued interest.

And with that, I'm happy to take any questions or names for partnership involvement. So, thanks very much.

Chair Burgess: Thank you, Jerry. Does anyone have questions for Dr. Poplin?

(No audible response.)

Chair Burgess: All right, I'd just like to say, Jerry, that I think that the communications position is an excellent idea.

I think that's going to be very important for moving forward.

I was also wondering what the situation was for you in terms of industrial hygiene, and whether you had any partnerships perhaps with the Cincinnati branch?

Dr. Poplin: Partnerships? We regularly reach out to Cincinnati, and so Aaron Sussell, who I mentioned earlier, he actually came out of the Cincinnati program.

He's both an epidemiologist, PhD, and a certified industrial hygienist, so he has deep ties there, and was in the HHE Program.

We did have an IH on our team, who's now an IH in Cincinnati.

So, we have pretty deep contacts and we reach out

regularly, and if any of our projects do entail some level of industrial hygiene expertise, that's basically where we go right away.

I'd just like to say, if anything came out of the HHE Program, they would come to us and ask for some mining expertise.

Chair Burgess: Great, thanks. Questions for Jerry from anyone?

(No audible response.)

Chair Burgess: All right, well thank you Jerry, again. Excellent presentation.

Now I think we have our most difficult decision, which is whether we take a long lunch and come back at the regular time, or come back early.

So Jeff, did you have a preference on that? Should we start again at, what would it be? 12:05 Eastern, and take a longer break now?

Mr. Welsh: What's the Committee want to do? Does anyone have a preference on the Committee?

Member Zimmer: My vote would be to see if we can get one more presentation in before lunch. How's that?

Mr. Welsh: Yes, that's fine with me, Jeff and Kyle.

Chair Burgess: Great. Let's follow Kyle's recommendation, and we'll have Mr. Drew Potts present on crystalline silica. Thanks.

Mr. Randolph: And Drew, I've given you control and I'm waiting for you to take control by clicking on the screen.

NIOSH Mining Respirable Crystalline Silica Research

Mr. Potts: Okay, great. The title of my presentation is NIOSH Mining Respirable Crystalline Silica Research, and I'm going to be reviewing both the

intramural and the extramural research efforts.

The first project that I'm going to talk about is developing and improving respirable dust controls in coal mining.

This is a five year project that began in fiscal year '20 and will run through 2024.

Discretionary funding's at \$162,000 per year.

The project has three specific aims.

They include examine and evaluate water spray systems for knockdown performance on respirable crystalline silica dust, and the use of additives to improve airborne capture.

The second aim is to examine and evaluate flooded-bed scrubber systems, and the goal here is to restore performance or maintain performance while the system is running.

So, it would be a design improvement type project.

The third goal is to evaluate aqueous foams to control dust emissions resulting from long wall shield movement, surface blast hole drilling, and operation of the stage loader crushers.

This work was initiated based on the increasing prevalence of severe form of CWP and the observation of r-type opacities associated with silicosis in coal miners.

As far as the setup for our Specific Aim 1, that's now complete.

Laboratory testing will be conducted to evaluate a range of sprays and their ability to effectively remove respirable coal and crystalline silica dust from the airstream. We'll use both randomized factorial experiments, as well as fractional factorial experiments with a null hypothesis that the test for these changes do not result in a change in knockdown efficiency.

The testing will evaluate water sprays up to 1000 psi.

Testing will also evaluate dust knockdown for specific material types, including 100 percent coal, 100 percent crystalline silica, and coal mixed with 10, 20, 30 and 40 percent crystalline silica.

Different surfactants, in addition to water, will be evaluated for their effect on dust knockdown.

As far as Specific Aim 2, we're currently constructing the facility for that.

We're working with Komatsu to develop a testing instrument that allows us to have access to various components of the system.

CAD drawings are complete, and we're in the process of procuring materials to build the facility.

Specific Aim 2 will focus on improving scrubber performance to maintain or restore scrubber performance during operation.

NIOSH researchers will contact operating underground coal mines to request fully loaded screens so that we can examine the particles that are on those screens and determine which ones are actually resulting in the clogging, and we'll be looking at both the size and the composition of that material.

Hopefully this will shed light on what's causing the clogging and will lead to design improvements.

Any design improvements that we come up with will also be tested against various feed dust compositions.

As far as the foam work, foam work will be conducted in the field.

Foam was not --- when we did our laboratory experiments foam was not able to be created with these sources but, there are new aspirated nozzles that we found in the firefighter industry that will be tested for their ability to produce foam without air.

Quaker wants to test a foam agent in a solid stick form for foam production.

Testing will be conducted to determine if the foamability and development parameters for foam stick longevity versus liquid foam agents will be determined.

A new foam generator that uses water-power only was also identified, so we'll be testing that to see its ability to generate foam. Once the testing is completed, successful outcomes will be taken into the field.

The applicability of foam at the stage loader/crusher for blast hole drilling will also be evaluated, as well as for preventing long wall shield dust generation.

Testing is complete for the shuttle car canopy air curtain.

We have a peer-review manuscript that's in draft right now.

The contract with Fletcher to develop this system is completed and we are awaiting the final report.

Testing was conducted at Peabody Energy's Francisco Mine.

Respirable dust reductions observed when operating the canopy air curtain included reductions in the mid-60s when loading behind the miner, in the mid-30s when dumping at the feeder/breaker, and in the mid 20s when the miner was tramming.

And interestingly, these were also significant at a 95 percent confidence level, which is fairly unusual for an underground study.

Peabody Energy's reviewing the system and they're determining whether they want to use it at all their mine sites.

But in the meantime, they are modifying their ram cars at Francisco Mine to continue to use the system.

And most of the shuttle car operators favored continue use of the canopy air curtains.

The second project that I'll be reviewing is entitled emerging respirable dust sensing and controls for metal/nonmetal mining.

This is a five-year project that began in fiscal year '20 and will run through September of '24.

Discretionary funding is \$118,000 per year.

This project and the next project is in direct response to the latest work-related lung disease surveillance report, which shows from the period of 1990 to 1999, 20.2 percent of the total deaths that occurred were in the metal/nonmetal mining industry, and that translates into 178 deaths.

The first task with this is to focus on low-cost dust sensors developed for pollution monitoring to see if they have application in coal mining -- or in mining. I'm sorry, not just coal mining.

The application of these sensors towards reactive ventilation systems for structures, mobile equipment and environmental enclosures would lead to improved air quality and lower exposures for mine workers while reducing the chance of respiratory illness. Smart filtration is the second one, and we have many years of experience on these filtration systems.

And a mathematical model was developed in 2008 by PMRD researchers to determine all the parameter and components that are involved in an effective system.

And from this study, it was determined that the key filtration parameters were filter efficiency, air leakage around the filter, intake filter loading, recirculation filter usage, and wind infiltration.

The components of a smart system, including monitoring and active control, are now at a point

where they're technologically feasible to build a system that will continuously try to improve air quality.

The third aim deals with coated sands. Coated sands, whether they be resin- or chemically-coated, claim to reduce respirable dust emissions through chemical and/or mechanical suppression means, but most have not been tested to verify these claims.

These coatings have the potential to reduce dust emissions throughout the product life cycle, but perhaps most significantly by reducing dust generated during the mechanical abrasion and loading processes.

The first task within this aim is to assess the performance of low-cost dust sensors against known mineral dusts from the metal/nonmetal industry in a controlled laboratory environment.

Before they can be useful in area monitoring applications, they must be proven to be reliable and accurate on mining dust and concentrations.

The most effective way to conduct this testing is under well-controlled test conditions performed in one of NIOSH's Marple aerosol chambers, which have the ability to routinely demonstrate less than 5 percent in spatial variability.

Based on successful lab testing, an array of sensors will be installed in an operating plant, such that dust concentrations will be known in enough spatial density to characterize the concentration of the largest-emitting sources, permitting then the control of ventilation systems that respond to these sensory input.

The smart building ventilation structure gains its intelligence from its ability to respond to changing dust levels, and this ability is made up of both sensor input and control systems, that would include such things as intake louvers and exhaust fans.

The second aim is also underway.

PGO just released a notice of intent for a sole source contract with Cyclone, who is a major U.S. mining filtration company to develop a smart-cab system.

With variable frequency drive fans, pressure and dust monitoring, and other measuring and control components, we believe that a superior cab filtration system can be demonstrated.

Our project, our work will have us testing, eventually in real environments, this prototype cab.

The field work's envisioned to be similar to what we did with Fletcher when we were verifying the parameters that we had come up with in the laboratory, as far as what was the most effective filtration pressurization parameters.

The final intramural project I'll talk about is entitled advanced exposure monitoring for airborne particulates in mining.

This project began in fiscal year '18 and will run through fiscal year '22, with a discretionary budget of \$109,000 per year.

The specific aim in this project related to controlling respirable dust include optimization of the field-based respirable crystalline silica monitoring technology, and to engage with corporate health and safety departments of mining companies within the aggregate sector, regarding the implementation of effective interventions for respirable crystalline silica through monitoring and control case studies that utilize advanced exposure monitoring techniques, including end-of-shift determination of crystalline silica and the Helmet-CAM.

The monitoring approaches provides the possibility for health and safety professionals to perform end-of-shift monitoring for crystalline silica in mines.

The monitoring approach is basically like a small

laboratory in the field. The approach is specific to respirable crystalline silica, not generic for respirable mine dust.

The approach is completely portable and it does not destroy the samples, which gives the opportunity to send the samples in for standard analysis.

Finally, the monitoring approach has been designed for non-experts of analytical methods in the field.

The tool can be used for assessing the levels of RCS in the mine and of mine exposures.

It can be used to identify and implement work practices and evaluate control technologies.

The field-based RCS monitoring approach is a three step process with an optional additional step for lab verification.

The respirable dust samples are collected using established sampling devices such as sampling pumps, cyclones, and cassettes.

The samples are then analyzed at the mine site with a portable FTIR analyzer.

And the raw data generated by the portable analyzer are then processed by NIOSH's FAST Program.

Since the process is non-destructive regarding the samples, the samples can be sent to an accredited commercial laboratory for standard analysis.

The development of the field-based RCS monitoring focused on several aspects and components.

The main component is the FTIR analyzer.

There are a number of analyzers commercially available, and we have tested and verify the performance of four of them for this application.

The results of the comparisons show that they were equal from an analytical perspective.

The dust sampling cassette is another important component of the approach.

To facilitate the analysis of the dust samples in the field, we have designed, in collaboration with Zefon International, a novel sampling dust cassette.

The cassette can be used with several samplers adopted in the mining industry.

The new novel cassette was designed as a shoot through cassette for the FTIRs, so that requires minimum handling, and it's been demonstrated to result in an even distribution of particles on the filter.

The NIOSH FAST software is critical to the transformation of the raw data into usable information and directly converts it into micrograms per meter cubed.

We are planning to publish a detailed user guide.

In fact, it's in external review at this point.

It's going to be a NIOSH numbered publication, and it will direct and train users for the implementation and use of this approach.

And finally, the entire monitoring approach is built around the analytical method that allows the quantification of RCS in respirable dust.

In 2019, the analytical method components of the field-based RCS monitoring approach went through a peer-reviewed process.

The review process identified some areas of research for optimization of the analytical method for quantification of RCS in respirable coal dust.

Thanks to the report, the project is focusing now to improve the characterization of respirable dust samples used for modeling, parameters used in the portable FTIR unit for analysis, and calibration of portable instruments with standard quartz materials, and quantification of quartz in the presence of other

minerals using chemometric multivariate analysis.

The field-based RCS method has gained a lot of interest in most of the mining industries for coal.

We've conducted a workshop with NMA, and also with the West Virginia Board of Coal Mine Health and Safety.

We're in contact with the largest mining companies in the Appalachian region, and exploring the idea of introducing this technology in their health and safety practices. Finally, BHP in Australia has started using this monitoring approach in their coal operations.

For metal mines, in the past we've been in contact with major companies operating in the metal industry, including Barrick, Newmont, Cliff Natural Resources.

At the moment, Freeport McMoRan is considering the adoption of the technology for their operations in Asia and the United States. Agnico Eagle in Canada has renewed the interest, and Teck Resources has purchased portable FTIR analyzers for this application in the frame of a large health and safety project related to the advanced technologies.

For aggregate mines, we're conducting specific case studies with single operators in the aggregate industry to demonstrate the benefits of using advanced monitoring techniques and to promote the implementation of these monitoring approaches.

We're also in communication with NSSGA, which is interested in supporting these cases.

This slide summarizes one of the case studies we conducted in collaboration with New Enterprise, a company which operates aggregate mines in Pennsylvania and New York.

We've conducted the case study by using the field-based RCS monitoring approach and Helmet-CAM technology in a sandstone quarry in 2008 and 2019.

We collected a large number of samples and sessions and we engaged in conversation with New Enterprise health and safety professionals.

And we assessed several tasks and work areas, and the general concept has been published in NSSGA Magazine in January 2020.

At the moment, we are working with New Enterprise to create awareness stories that can be translated into fliers that New Enterprise is planning to use on bulletin boards at their worksite.

In addition, New Enterprise is interested in using the findings of the case study for annual training.

And we plan to engage with the training team at NIOSH to transform this content in this format.

Finally, we have another company lined up for a second case study once we are allowed to do field work again.

We have a new concept that, if funded, will start in October.

The NAS report, monitoring and sampling approaches to assess underground coal mine dust exposures, which was published in 2018 by NAS, includes many recommendations.

One recommendation was to conduct a systematic evaluation of trends in mining practices to determine the extent to which these changes have caused increased extraction of rock, and the extent to which the past rock extraction has been co-located within disease hot spots.

One task is to determine current mining conditions, ventilation, and dust control practices.

When those steps are complete, we will examine potential links between mining methods and disease rates.

The project is entitled investigating mining practices

and respirable crystalline silica exposures in underground coal mines.

This is a three year project that will begin in October of this year, with an annual discretionary funding of \$35,000 per year.

Annually, NIOSH Mining sponsors and administers extramural research to complement our intramural work.

Since 2008, extramural mining research has been conducted at more than 28 academic institutions and 49 companies.

Recently, this work has been focused on addressing the highest priority issues presented by the National Academy of Science.

For example, University of Kentucky is researching measures through the improvement of scrubber technology to provide a cleaner and healthier mine environment for all underground personnel exposed to RCMD levels in excess of the standard.

There was concern that just focusing on the DO and ODO designated occupations may not be appropriate for protecting everybody.

Michigan Tech is engaged in this effort by evaluating how the mining environment changes by location and over time.

NAS further recognizes that the nature of coal mining exposures may have changed and recommended updating toxicological studies.

Penn State is working in this area, and recommended updated toxicology studies, improving knowledge about the types of dust that coal miners are exposed to today.

Addressing NAS Recommendation 4, this work will improve our understanding of exposure-response relationships based on the properties of the respirable coal mine dust found in modern mines.

Outside of NIOSH Mining, additional research is being conducted by NIOSH Health Effects Laboratory Division to evaluate the toxicological effects of work-related exposures in modern coal mines.

To meet the goal of NAS Recommendation Number 5, NIOSH Mining has coordinated recent extramural research to improve the technology used to measure RCS exposures.

Through BAA solicitations and awards, NIOSH has worked with major equipment manufacturers, like Thermo Fisher, to pursue the next generation devices capable of providing real-time RCS and RCMD concentrations.

The University of Reno, Nevada is currently developing such a device that continuously measures concentrations of both coal and silica dust through the heat and pressure produced when dust is illuminated by specific laser wavelengths.

In Recommendation Number 6, NAS raised concerns about the current RCMD monitoring equipment.

They recommend that newly developed devices be both less costly and more ergonomic when worn and operated by coal miners.

Several contracts have been awarded to pursue this goal.

The University of Illinois at Chicago is working on a miniaturized device that is self-contained and can be worn on the lapel or clipped to the miner's work clothes.

An ongoing contract with Thermo, the maker of this current CPDM, is working to develop the next generation of the CPDM with smaller components for a more ergonomic instrument.

An additional award to Biomarine in 2008 hoped to use alternative measurement technologies to make a smaller and lighter dust monitor.

The Biomarine effort, however, concluded in 2019 without a successful product.

In response to feedback from the industry stakeholders, namely the cost of the CPDM, additional NIOSH Mining solicitations have been made through the annual BAA process to develop tools that can quickly provide dust measurements for engineering evaluation without the need to use expensive compliance tools. Lastly, NAS Recommended Number 7 suggests research into the current dust found in underground coal mines.

Fundamental information on the characteristics of current RCMD has been developed by UNR, New Mexico Tech, and Virginia Tech.

They have each used these opportunities to develop new sampling approaches and analytical techniques, such as low-temperature ashing, FTIR, automated SEM-EDX.

These techniques can provide insight into the unique physical and chemical properties of modern RCMD that may contribute to the ongoing rate of CWP.

And with that, I'll take any questions.

Chair Burgess: Thank you, Drew. Are there any questions for Mr. Potts?

Member Harman: Drew, back to the air canopies on the shuttle cars.

When NIOSH did those tests, was there a difference between the exposure for the on side operator and the off-side shuttle car operator?

And if so, which one had a lower or higher result?

Mr. Potts: No, we only modified one of the ram cars. So.

Member Harman: Thank you.

Mr. Potts: Yeah.

Member Wright: I've got one, unless somebody else?

Chair Burgess: Go ahead, Mike.

Member Wright: Yeah, okay. Drew, early in the presentation, you used the number 178, and I thought it was deaths in metal/nonmetal mines from I guess silicosis.

I didn't catch the period or the reference where it came from.

Mr. Potts: Okay, I can provide you the reference.

I don't have that in here, but it was, based on the fact that silicosis was the underlying cause of death, and 20 percent of that came from metal/nonmetal mining industry.

And if you did the numbers, it worked out to like, 178.

The time period was the 1990s and 1999, I believe. Let me check that real quick.

Member Wright: Okay.

Mr. Potts: Yeah, 1990 to 1999, so it's a ten year time frame.

Member Wright: Okay, thanks.

The other one was the appeal-based approach that you talked about.

Do you have any numbers for what the cost would be for different sized mines?

I mean, what would a mine operator have to spend to really implement that sampling strategy?

Mr. Potts: To implement the FAST sampling strategy?

Member Wright: Yeah.

Mr. Potts: You can buy an instrument probably for around \$15,000, and I believe the cassettes are in the range of like 15 to 20.

Member Wright: Yeah.

Mr. Potts: So, when we calculated the numbers, it worked out to like about 200, where you would be at break-even if you sent them all out for analytical testing.

Member Wright: Okay. Thanks.

Member Bowersox: This is Ron. Drew, a couple questions.

On that slide of the shuttle car, just concerned about maybe the operator's visibility with the added devices.

Is there a question or concern about that?

Mr. Potts: The only thing I can say about that, Ron, is that the operators continue to want to use it, so I guess they didn't feel that there was a problem with the visual, but it would definitely be a concern if it was -- it's above the operator, so I don't really think it would impede the vision that much, but--

Member Bowersox: Oh, it's above the operator? That picture might've been a little misleading, so everything's above the operator?

Mr. Potts: Well, yeah, but the tubing coming in, but I mean, that kind of runs along the side of where they're loading.

So I don't think it would obstruct the view that much, but that might be a consideration for sure.

Member Bowersox: The other question is on the Thermo Fisher with the CPDM.

Do you have an idea of where they're at? I mean, time line, because that is a big concern, the size and the weight.

Mr. Potts: I do not have information on that, but I can definitely get back to you.

Member Bowersox: Okay, I appreciate that.

Mr. Potts: Typically, those contracts are two to three years.

Member Bowersox: That's all I have, thank you.

Chair Burgess: Any additional questions for Drew?

(No audible response.)

Chair Burgess: All right, not hearing any, Drew, thank you. Fantastic presentation. Exciting stuff.

So, let's go ahead. We'll take a 30 minute lunch break for those on the East Coast, and a coffee break for everyone else.

For 30 minutes, so it's now 11:45 Eastern, so we'll start again at 12:15 Eastern Daylight Time.

And I look forward to seeing all of you again at that point.

Jeff, is there anything else I need to do to close us down for lunch?

Mr. Welsh: I think everybody can go now. Thank you.

Chair Burgess: Great, thank you. See you again soon.

(Whereupon, the above entitled matter went off the record at 11:46 a.m. and resumed at 12:16 p.m.)

Chair Burgess: Well, welcome back everyone from the break, and it's our pleasure now to hear the presentation by Dr. Steve Mischler.

So please Steve, go ahead.

Understanding Elongate Mineral Particle Exposure in
Mining

Dr. Mischler: All right, good afternoon.

I just want to thank the Committee for giving me the opportunity to update them on our project,

understanding elongate mineral particle exposure in mining.

I'll be reviewing the progress made, but of course, all of the work was done by the dedicated scientists on the minerals team shown here, so I just wanted to acknowledge all of their good work in producing the results that I'll be updating the Committee on.

During this presentation, I often send out this slide just to establish definitions for what we're talking about.

I'm sure many are aware that the nomenclature around elongate mineral particles and asbestos can get very complicated, so I like just to put out these definitions of when I talk about asbestos, we're talking about purely a commercial term of the six naturally occurring silicate minerals that most people would understand as being asbestos.

When we talk about elongate mineral particles, we are actually opening up this category to more fiber type particles.

And so, we use the broadest definition of EMP that's really available within the literature.

I just wanted to update you on those definitions.

Really, most of the work that'll be done in this research, or is being done on this research project, was established or discussed in the NIOSH Roadmap, the asbestos fiber and other elongate mineral particle, state of the science, and roadmap for research.

So, we are really using this document as a basis for the research that we will be doing on this project.

NAS also reviewed this roadmap and made several recommendations that we are including in our discussion.

So, one of the recommendations was improved terminology that my first slide on definitions is, you

know, just an effort to show how complicated some of the terminology can be, so throughout this project, we would really like to establish a terminology that we can maybe use throughout the industry when talking about these elongate mineral particles.

We want to sort of strengthen the emphasis on mineralogical research, and the reference, develop a mineral repository.

So these are all essentially NAS recommendations that we will try to meet.

The project has three specific aims. The first specific aim is to understand a miner's potential exposure to asbestos and other EMPs.

And we're going to do this by analyzing bulk material that has been previously collected from mines across the country.

I'll talk about each of these specific aims in much more detail in the next slides throughout this presentation.

Over 20 or 30 years ago, NIOSH collected a large amount of bulk material samples from pretty much every commodity across the country that has mined across the country.

And so, we'll use these samples to analyze them, to gain geologic knowledge of these deposits and the host rocks, just to see strategic --- (audio interference) -- of the EMP bearing strata.

Specific aim 2 is to further elucidate the toxicology of EMPs, and again, there's a lot of questions about what's the main characteristic of these particles that is causing health problems?

And actually, through this project, we'll be looking at ways of defining these characteristics, and then understanding the exact health basis of the toxicity concerns that are occurring due to exposure to these particles.

And then finally, we're going to investigate an application for sort of qualitative and quantitative analysis of these EMPs.

The idea behind this specific aim is to make analysis easier.

Similar to what we've been doing with the silica project at the end-of-shift, a silica or exposure assessment, we would like to be able to discover some technologies that may be able to give people an end-of-shift idea of what their EMP exposure was.

So, Specific Aim 1 again is to understand the miner's potential exposure.

The idea behind this is that we'll analyze bulk material from many mines across the country, and then we will use this geologic analysis, this detailed characterization, in order to create a map that stakeholders can use to help define or to help create their health and safety plans when they're working in an area where EMP exposure may be a potential.

And I think the advantage of this particular Specific Aim is that we can give using the geologic information that we'll be collecting, we'll be able to really assess the possibility for this type of exposure when we're mining any of the commodities across the country.

You can see just this is an idea of the type of material that we have or the samples that we have from all the many different commodities, as well as the map on the bottom right shows sort of the mines across the country.

So, we really are picking areas, or we have bulk samples from areas across the country and in many, many of the commodities.

And then, we are going to try to develop a standardized classification for these EMPs, and again, I talked earlier about the imprecise terminology related to many of these particles.

So, we're really going to, through this characterization, we think that we'll be able to hopefully establish a more precise terminology or a unified classification system that government and industry and the public can adopt to make just a more consistent working definition for exposure to EMP.

All right. The slide's not advancing.

Mr. Randolph: Sorry about that. You need to take control back.

Dr. Mischler: Oh, okay. Did I take it back?

Mr. Randolph: By going after one of the controls, I took it back inadvertently.

Dr. Mischler: Okay.

Mr. Randolph: Should be able to go now.

Dr. Mischler: There we go. Okay, well, so when we were, you know, doing the geologic characterization, one of the interesting aspects that came up was in order to analyze these materials, these bulk materials, we often need to mill them or we need to process the materials in order to use certain analytical techniques.

You know, you have to form a dust out of rocks, essentially.

And these milling processes, we've come to understand, can actually affect the crystallinity of these elongate mineral particles.

So, when we're doing the characterization, we're looking for this, for crystallinity, we're looking for certain other mineralogical characters.

And the milling process, so the very initial part of the analytical process has been shown to effect some of these characteristics that we're analyzing for.

And so, we decided to undertake as part of this first

specific aim a study that looks at the changes that occur due to the milling or due to the processing of these bulk materials or these larger materials.

And not only will they affect the characteristics geologically, or the physical characteristics, but we're looking, we're evaluating whether or not these physical effects of the milling process may also have resulted or causes differences in biological experiment with these materials.

So maybe some of the heavily milled material would've caused a change in the toxicity experiments.

So, what we're doing with this particular project is we are using several of the more commonly used milling processes to look at material, both asbestiform and non asbestiform material.

And then we're going to both analyze them through physical characteristics and mineralogical characteristics, but also we'll be running some biological experiments with them to see if the toxicity changes in relation to, or the toxicity changes are correlated to some of the changes caused by the milling process.

So this is a project that we started, and of course has been interrupted due to our inability to get back into the laboratory, but we're fairly well along.

We've milled material using I think all six of the milling processes that we're looking at.

And currently, what we're doing is we're in the process of collecting a similar size distribution for each of the milled and unmilled material because we're trying to reduce the number of uncertainties that we have, and so by doing analytical tests and toxicity tests using a standard or the same size distribution, we think we can reduce some of the unknowns in those experiments.

And so this is the instrument or the setup that we use

in order to collect this respirable size fraction of these milled and unmilled material.

And again, we will do a lot of the analysis ourselves in the lab once we collect these samples, and then we'll be working with our partners at HELD in Morgantown in order to do some of the toxicity work associated with this project.

The second specific aim is to further elucidate the toxicology of EMPs.

And so, essentially, in the past there hasn't really been an established method to separate EMPs based on certain characteristics.

The first characteristic we're going to use for separation is simply length.

And there have been studies in the literature that show some larger -- you know, it shows shorter versus longer particles.

And oftentimes, those particles or those studies use some of the milling techniques that we have just previously talked about.

So, we're going to try to figure out a way to separate these materials so that we can have very distinct size distributions, one let's say longer than five micron particles, and one that would be only a particle smaller than five microns.

And the separation, although it seems easy in theory, is actually very, very difficult to do when we're actually trying to do the separation.

So, we've been looking at several different techniques to see how it would work.

The first one we looked at is an instrument called the aerodynamic aerosol classifier.

And you can see with this particular separation, we were able to do a nice job in separating smaller and larger particles, so we were able to get good

separation.

The problem with this instrument is that we don't get enough material out -- the output is not high enough in order to actually collect enough material to do toxicity experiments. So, it would take several weeks in order to collect enough material -- to our, to our sister organization, you know, to Morgantown in order to give them, or for them to have enough materials to do, to do the experiments with.

So, we had to look for another option. We tried a multi-cyclone sampling array. Essentially, the idea behind this is that we just collect different size particles with each of these, with each of these cyclones in series. So, the first, the first cyclone would collect particles that were much larger than the final, than the final cyclone.

The problem with this instrument is we got some separation, but we didn't really get good separation between the larger and the smaller particles. And if you don't get good separation, oftentimes many smaller particles will be found in the larger particle, in the larger particle sample.

And the problem with that is smaller particles are much more abundant than larger particles. So, when you're doing toxicity tests or you're doing analysis on these type of samples, the smaller particles that are inadvertently in the larger particle sample may affect either the toxicity of the sample or, you know, other characteristics that we're analyzing for.

So, we really need to get a good separation. And this particular technique didn't give us a good separation between large and small particles.

The final, the final one we've been using and we found reasonably good success with is a filtration system, essentially. We just run the particles, the bulk material, or the processed material through several filters and we're able to collect different sized filters at different stages, or we'll be able to collect different sized particles at different stages. And we've

really had some pretty good success with this.

You know, we're essentially getting 95 percent or so separation. And we think this is the process that we will be moving, be using with or moving forward with. And the other nice thing about this particular technique is that it gives us plenty of material so we can really, we can really collect a lot of materials, as much material as we need for both the analysis and for the toxicity work that will be coming along later.

And this is just an example, a picture of sort of the separation that we were able to achieve using this at each of the filter sizes so that, you know, you can see the later particles versus the smaller particles. And there's really a few small, smaller particles in the large particle sample.

So, that was something that will be very, very helpful and avoid any sort of contamination in this particular area.

So, one of the things that we do in order to establish a size distribution for this material, or check that we're using the proper, the proper size distributions is we actually have to do fiber counting on filters. And it's actually a reasonably detailed technique and it takes some time.

And so another area of research that we're looking into is sort of a way to do a semi-automated particle size measurement so that we can collect some of the particles on a filter, and then we can put it in an SEM, do an analysis, and then have sort of the computer can actually do, look at the particles and measure them, and then give us an output of the size distribution.

The problem that you have with the particles that we're working with is oftentimes they're irregularly shaped. And so it's not easy to teach a computer or it's not easy to teach a system to recognize these irregularly shaped particles.

So, we're in the process of doing that. And, you

know, if we're successful, it will enable us to, first of all, keep the analysis controlled so we won't really have any operator error in the size measurements, which is an advantage. And it will allow us to analyze more samples, which will also be very helpful for our project because the sample analysis is one of the largest time-contributing aspects.

But we are working, we just recently sort of started setting up a collaboration with a team in Spain that is doing some of this analysis. They're using the MATLAB program. And so, we'll be sending some photos of our analysis, pictures, to them to see if their technique works. So, we are doing some collaboration outside of this, you know, with other researchers.

We're also doing some collaboration with Thermo Fisher. They have some interesting techniques. Typically when we're looking at these elongate fibers you would do a TEM analysis, and then you would do a SAED analysis in order to characterize the fibers chemically.

And Thermo Fisher has been working, they have different ways, different techniques to use an SEM to get that same sort of chemical analysis. So, we set up a collaboration with them in order to do some of this work and to see how well.

It's very difficult to get a good EBSD, get a good EBSD analysis or EDS analysis on the fibers just because, as I mentioned before, they are so irregularly shaped. And oftentimes when you're doing these types of analyses you need the fiber to be flat.

So, again, those are the types of details that we're working with in order to see if we can successfully create a technique to use the SEM and EBSD in order to do these chemical analyses.

And I think our final specific aim, again, is to establish an application of qualitative or quantitative analysis. And there are several techniques that we're looking at to be able to do this.

FTIR is one. If the FTIR work was successful it would very -- it would lend nicely to the rest, the crystal and silica work as well. You could almost do the same analysis on the sample and you would be able to get the EMP resolved and you would be able to get the crystal and silica resolved.

So, the FTIR is handy. There are some filter techniques that can give you sort of end-of-shift that you can dye certain, certain fibers, and it just makes it much easier to count.

And then there's also some Raman analyses techniques that we'll be looking at at the end of this year.

So, that's kind of where we are. This is, you know, the work on this specific aim hasn't started too -- you know, we're sort of, it's the last piece of the game so we haven't done a lot of work yet, and we're just sort of establishing the protocols to start some of that work.

And I believe that is the end of my update. And I'm happy to take any questions.

Chair Burgess: Thank you, Steve.

Does anyone have any questions for Dr. Mischler?

(No response.)

Chair Burgess: While they're thinking of some, Steve, I had a question for you.

So, Steve, nice presentation. I appreciated it. You got very foundational for parts of your presentation, including the definition of, you know, the elongate mineral particles. This strikes me as being somewhat of requiring international harmonization.

You had mentioned that you were working with some specific partners, for example, some labs in Germany. But is there a larger framework that you're working within let's say with other government organizations?

Dr. Mischler: Well, we, there is sort of a beginning of a larger organization. We held a symposium a couple weeks ago that looked, was looking at essentially naturally occurring asbestos. And so, we had been talking about putting together an international collaboration. Nothing has been really established firmly yet.

We are working with a group of the government agency in Germany. We're working with an agency, again, in Spain. And then we've been working with some people in France as well to do some of this research.

All of these collaborations are pretty, are pretty new and sort of right at the beginning of the collaboration. We're still working through protocols to do.

But, I mean, the German work is really interesting because we're doing, looking at different ways to sample for EMPs. They currently sample using just a general cowl sampler, it's an open-faced filter. With this group we're hoping to look at using a cyclone or a real respirable sample in order to collect those types of samples.

So, yes, we are working with other government agencies in other countries.

Chair Burgess: Right. I applaud you for that. Thank you.

Any other questions for Steve?

(No response.)

Chair Burgess: Okay. Not hearing any, thank you very much, Steve. Again, appreciate your presentation.

Let's go ahead and move on to Mr. Bruce Watzman. Bruce.

Future of the Coal Industry

Mr. Watzman: Thanks, Jeff. It's a pleasure to be with

you. And it's a pleasure to be back to see all the committee members. I wish I could see you personally, but I guess this is the next best thing.

I've been asked to provide a snapshot of what's happening in the coal industry. Suffice to say that the industry has and continues to undergo significant change as the combination of abundant and cheap natural gas, combined with stringent environmental controls, concerns about carbon reduction goals, and state and local municipality mandates has resulted in the retirement or planned retirement of a significant, significant portion of the coal-fired electric generating fleet.

This in turn has resulted in the shuttering of a number of coal mines across the industry, a significant drop in the production, and an ongoing shift in production across the coal basin.

So, that's what I'm going to cover today.

Tom's on the phone. Ron is on the phone or in the meeting. And I'll be curious to hear their comments at the end because I'm sure that they have a view on this as well.

You know, for your purposes there are, and for those who aren't familiar, there are two basic types of coal: thermal coal that is used for electric power generation, and metallurgic coal that is used for steel making. They are very distinct. They have characteristics that derive how they are used.

The production methodologies, however, are the same. And from a health and safety perspective, while the coal used for thermal generation, electricity generation is declining, metallurgic still is around. Metallurgic coal will remain an important component of steel making, both domestically and internationally.

And I think that certainly during our working careers, and then some, we will continue to see coal produced in the U.S., probably not at the, never again at the

numbers we saw not that long ago of over a billion tons a year. But coal will remain a part of the energy mix. And the health and safety considerations will remain. And that's, I know, a focus of this group and certainly NIOSH.

And let's see if I can get this to advance.

Bob, do I have control of the screen now?

Mr. Randolph: You have to take control. And by tapping on the screen and after a few seconds you should have full control.

Mr. Watzman: Okay. All right, I now have control.

So, the first thing I want to cover with you is what's happening in the electric power sector, because that's where the bulk of the coal is used that's produced today.

What this shows is what occurred in 2018; the green line 2019; and the broken line on the bottom-left of the graphic is what's been seen so far in the first two months of 2020. And I can tell you that the numbers haven't gotten any better.

Before I get to that I have to thank my friends in EVA. They are a forecasting firm. They're one of many private, government forecasters that follow the coal industry. I think all of the forecasters, no matter who you ask, there's general agreement across all of them that coal has a shrinking footprint.

There's a disagreement as to the speed with which these are occurring -- this is occurring, and the opportunity for a rebound in the coal industry. But, you know, what you see here is the domestic coal demand for power generation. It continues to decline at what I would consider an alarming rate.

It wasn't that long ago that coal's share of power generation was approximately 50 percent. And that was in the early 2000s.

It's dropped to 30 percent. And today, through the

first two to three months of this year, it's 17.7 percent. That's versus 26 percent during the same time period last year.

Now, there are a lot of factors that come into play in driving this. Certainly COVID has played in this because there is not nearly the demand for electricity that we've seen in the past. As the economy rebounds -- and we all certainly hope it does -- as it rebounds will the coal generation increase? Likely so. But right now it's running under 20 percent.

And, you know, there's nothing on the horizon that anyone is pointing to to return it to the, certainly not the percentages of 2000, and maybe not above 30 percent. You know, the outlook for domestic coal remains weak, primarily, as I said earlier, due to lower gas prices and greatly reduced electricity demand.

The 2019 coal burn fell 35 million tons, and that followed a drop of 14 million tons in 2018. Depending upon the forecasts you follow, the coal burn for 2020 could drop 40 to 50 million tons this year.

And, you know, what is driving this? Well, certainly natural gas. Cheap natural gas has taken away the biggest component of coal's market. But also wind and solar. Wind and solar are projected to reach 14 percent of the total generation by the end of this year, and 20 percent by 2023.

Solar's share is still small, it's less than 3 percent, but it's growing rapidly, up 800 percent in the last five years.

And there are several things that have brought this about. It's not just, not just cheap natural gas and, you know, solar and wind. There are externalities that have played into this.

During the last administration there were new environmental considerations imposed called the MATS rule, mercury and air toxics. When that rule was finalized, utilities has three years to make a

decision, were they going to install new environmental controls on their existing fleet, or were they going to retire those and build new generation capacity with natural gas and renewables?

Well, what they chose is to build new capacity. And the reason they did this, quite honestly, was a business decision. They had depreciated the coal plants. They went to the PUCs and they said, if we retire these and build cleaner generation, can we put those in the rate base? And the utilities, the PUCs, said yes, you could.

So, there was an incentive, a business incentive on the part of the utility to switch to this newer generation.

What's happening right now with the remaining coal fleet is the utilities are derating it. You can't flick a switch and turn a coal plant on and off. They don't operate in that manner. So, what they're doing is they're generating, not across the board but in many instances, the minimal amount of power they need to generate to keep the plant operating. And, you know, they're backfilling that with cheaper, what's become cheaper power in terms of wind and natural gas.

You know, one of the agencies, or the premier agency that looks at this from the government's perspective is the Energy Information Agency. And what they said is that for renewables they account for the largest share of new generating capacity in 2020. And as I said, they forecast that renewables are going to grow by 11 percent a year going forward.

Well, what does this mean in terms of the coal retirements? Now, this is by power market. And this looks at the transmission grid as separated into various power markets. And that's designated by the various colors here.

So, you can see across PJM is the Northeast: Pennsylvania, Ohio, you know, West Virginia, Virginia. That's been the largest consumer of coal. Some of the other ones far less, some hardly any coal

whatsoever. But you can see that they're all retiring a significant amount of coal-fired power.

In 2010, 2,000 megawatts of coal-fired power was retired. By the end of 2019 it was 98,000 megawatts. And if you look at the past and announced retirements, it will be 133,000 megawatts of coal-fired power. And that's 42 percent of the coal fleet.

So, 42 percent of the coal fleet has either retired or the retirements have been announced already. Just an amazing number when you think about the baseload workhorse that took us through the industrial ages and brought us, got us to this point.

You know, there are 13 announced closures for this year. Five boilers at three plants have closed year-to-date. And those are, those are continuing. So, as this transition has taken place in the U.S., understandably U.S. coal producers have looked internationally to try to make up for some of that.

Well, wait. Before I go to that, the other factor that's impacting coal right now is coal stockpiles. Unlike natural gas, unlike solar and wind, coal is kept on site. And it's typical for a utility to have somewhere in the range of 75 days of coal at the plant. This is due to a multitude of factors, I mean, one of them being what it takes to transport coal to some of these plants.

But you can see now the stockpiles are at historic highs. I can't tell you that they're at the highest they've ever been, but what I can tell you is that these are highly unusual and it's causing utilities to go to their coal providers to try to defer deliveries because, quite honestly, they have nowhere to put the coal on the grounds.

So, producers have looked internationally. And that's understandable. And in two thousand -- beginning in 2016, '17, and '18 there was significant growth in steam coal exports by basin. 2019 it dropped. 2020 it's going to drop even further.

The biggest basin in the country for coal production is the Powder River Basin. These are large, large, large surface mines -- you know, different health and safety considerations. And I'll always go back to that. But that's where the biggest drop-off has occurred and continues to occur.

Since 2018, Powder River Basin is down 21 million tons. And the Powder River Basin may be down as much as 40 million tons this year. That's an unbelievable number to think about one basin shuttering that much production. But that's occurring. It has occurred and it continues to occur.

And, you know, going back to the fleet, understandably, when the utilities made the decision under the MATS rule what they were going to do, they shuttered the oldest plants in the fleet. So, the average age of the plants they've shut up to this point are 49, 50 years old. The remaining fleet is 42 years old on average. And the life of a coal plant is around 70 years.

There are no new coal plants in the pipeline. That's a scary proposition. We haven't seen a new coal plant build in -- and Tom or Ron will probably correct me on this -- but I think the last new coal plant that opened up was probably ten years ago. So, there is nothing happening domestically.

And what is occurring now, what occurred domestically is now occurring internationally. Internationally the same pressures that occurred here, the environmental considerations, are occurring internationally.

England, Wales, Scotland are now absent coal. They don't burn coal. Portugal doesn't burn coal. The traditional countries that where we, where we exported vast quantities of coal have started to draw back on their demand. And the U.S. is behind the 8-ball to begin with because of the inert, because of the transportation needs that we have. It's not easy for us to get coal to Europe. And it's certainly not easy for us to transport coal to Asia because of the limited

port capacity on the West Coast.

Where are we today? Well, total exports are down 25 percent year-to-date. Last year they were 48 million tons, and they're projected to be 40 million this year.

India, a major consumer of U.S. coal, is down 33 percent. South Korea, down 18 percent. The Netherlands down 21 percent.

Now, you know, the projections are that some of this will bounce back. But we will never be able to sell into the international market an amount of coal sufficient to make up for what we're losing domestically. I mean, that's just a fact of life. When you're losing three to four hundred million tons from the electric generating market here, you just can't replace it internationally.

The other that I talked about is met coal. And met coal is a niche market. It's a unique market. It's highly sought after. I will tell you that the producers in the U.S. today, the big producers, whether it's Peabody, whether it's Arch, whether it's Consol, whether it's Alliance, I mean, they're all chasing and maximizing their production of metallurgic coal.

The price is entirely different. It's derived in the global marketplace. But, you know, unless the way we manufacture steel, and there are alternatives to not use as much coal, but that's really not happening quickly. So, there will always be a demand for, demand for met coal.

But even the met coal market has softened. I mean, one of the biggest we ship to is Brazil. That's down over 11 percent; Japan, down 10 percent; India, down 12 percent. You know, the exports this year are expected to fall from 53 to 48 million tons. Hopefully, this projection is correct and that they will bounce back. But you don't see a lot of growth at least through 2023, some minimal growth but just not a lot, a lot of growth.

So, where does that bring us to round this out? You

know, this is the supply and demand forecast. The numbers tell the story.

The electricity burn is projected to go from 531 million tons last year to 482 this year. It's just a massive drop-off.

You know, you see the Powder River production, 294 to 259.

Metallurgic, you know, a little bit of a drop-off, but on total, you know, we could be talking about a reduction this year of 100 million tons of production.

How quickly that rebounds, to the degree that rebounds is really the great unknown. There is no crystal ball. There are a lot of external forces that are working against coal right now. And there's really no technologic breakthrough near-term that I think will shift the dynamics of this, especially from the thermal perspective.

Lastly, I wanted to, you know, round this out with some recent headlines. And you can read this as well as I can. There is no good news about the coal story right now. I could have updated this since I put this together and sent it to Jeff with more headlines and more stories. And they're all the same.

What I find particularly interesting right now, or particularly troubling if you will, is the increased pressure on the lending institutions and the insurers to walk away from coal. Those are critical to the domestic industry remaining intact. And if coal operators can't get insurance to underwrite their liabilities -- and they're required to by law, whether it's the reclamation liabilities, the black lung liabilities, worker comp liabilities -- if they can't get financing for expansion plans, I mean, I just think that this is going to spiral a lot more quickly than anyone anticipated.

I'm sorry to be the skunk at the picnic, and I'm glad we did this after lunch rather than before lunch. Jeff, I was very fearful you were going to call on me and I

was going to ruin everyone's lunches. But, you know, that's, that's the story as it exists today, unfortunately.

And with that, if there are any questions. If Ron or Tom have anything that they'd like to add, I'd welcome hearing it.

Chair Burgess: Go ahead, Ron.

Member Bowersox: This is Ron.

You know what, we did kind of did this same type research that you just did, Bruce. And we are having short work weeks, you know, at most of the big operations. Stockpiles, that's a key, large stockpiles. So, a lot of the mines are just, as they clear the stockpiles, they're working a little bit to replace what they just sold.

We've had some layoffs. You're right, the last power plant I think was built -- and it was a small one -- that was, like, 2011.

Mr. Watzman: Yeah.

Member Bowersox: You know, so, like I say, the demand for factories have shut down for this COVID-19. So, demand for electricity is a lot lower.

Yeah, we kind of did the same research. And it's a sad, sad thing.

Mr. Watzman: It is.

Member Bowersox: But you're right on it.

Mr. Watzman: The one thing I want to go back to, and again before Tom jumps in, is the health and safety consideration. Historically, the mix between surface coal and underground coal has been roughly 65/35, with surface coal, because of the size of the Powder River Basin operation being 65 percent of the production, that number is shrinking. And I think we're probably closer to 60/40 now, and maybe even less.

So, in light of, you know, what's been talked about already and the portfolio of NIOSH in terms of safety and health research as it relates to coal, I mean, the remaining coal and the focal point is going to be underground coal. So those, those safety and health considerations become even more important than they already are.

Member Harman: Bruce, your, the presentation was a stark illustration of the stark reality that the coal industry is right now. And your statement about no new greenfields coal plants is correct. There aren't any that I know of.

The only, you know, there is one, if you can frame it this way, bright spot in the coal sector right now, and that was the change from the Federal Energy Regulatory Commission earlier this year and a policy for the minimum offer price rule.

Mr. Watzman: Right.

Member Harman: That will, you know, force states that do provide subsidies to the alternative and the renewable sources to include those costs into their minimum price offers onto the grid. So, you know, but that, that's so recent that you really can't tell any difference now, or certainly for sales, that, you know, it's -- and thermal coal is particularly hard hit.

You mentioned the Powder River Basin, the 60/40 split, that's a, you know, it's a tough time for everybody in the coal industry right now.

Mr. Watzman: It really is. Really is.

Chair Burgess: Okay. Do we have any more questions for Bruce, or comments?

(No response.)

Chair Burgess: Okay. Not hearing any, Bruce, thank you again for that presentation. Appreciate all the time and effort you put into it.

So, let's go ahead and move on to Ms. Jennica

Bellanca. I hope I pronounced that correctly.

Ms. Bellanca: Yes. Thank you.

All right. Looks like I have control. Can everybody hear me okay?

Chair Burgess: Yes.

Haul Truck Health & Safety Issues - Research Roadmap

Ms. Bellanca: Great. Thanks.

So, thank you for the introduction. And today I'm going to give an update on the haul truck health and safety issues research roadmap that I talked to the MSHRAC Committee a little bit about in the November meeting.

And just as a reminder, the reason we're focusing on this is an increased focus related to powered haulage where it's historically been accounting for 50 percent of all mining fatalities each year. And of powered haulage, haul trucks are one of the largest contributors, with six in 2017, and six fatalities in 2018.

And haul trucks are also where we chose to focus our efforts because they account for the large majority - - or the largest percent of mining equipment, including 45 percent of surface mining equipment.

So, in order to begin looking at this, we started a project that looked at characterizing the health and safety issues related to haul trucks. And to do that, our first task was to create an initial version of a roadmap by talking with the industry, as well as performing an analysis on the fatal accidents related to haul trucks.

These industry discussions were with regulators; with industry groups; with mine sites, including visits, discussion; as well as with manufacturers and different companies related to the mining industry. And the fatal analysis was looking back 14 years from

2005 to 2018.

So, that's really what's going to drive and color the discussion of what I'm going to present to you today. And this is the first part of the project that we will be completing at the end of the next fiscal year.

And from all of that, what our big take-away is that there is currently a systematic lack of development, implementation, and integration of haul truck-related health and safety intervention. While there's a lot of work that's going on related to haul truck health and safety, this work is often being done in isolation where we're not looking at all parts of the picture or talking to all parts of the organization.

We believe that a systems approach should be taken to fully integrate these interventions and achieve the full health and safety benefits.

And this is really important to take a systems approach, because all levels of the mining system overlap and are interconnected. There's lots of different models that talk about the mining system and outline it, but they have, in general, four main parts.

The first of which is the external piece. And that's really the industry-wide forces that influence the adoption of safety and health intervention. This is regulation. This is the climate of the global climate as well as the climate of the United States.

Within the external we have the organizational. And this is really focusing in on a company. So, a company and company representative who make decisions, create policies and procedures that can affect worker health and safety.

And within those organizations you have the workers themselves. And these are really individuals who are making decisions or taking action that can affect their own health or safety or the health and safety of others.

And surrounding all of those pieces is the environment and the technology. And this is really referring to the conditions, systems, solutions, and interventions at the mine site that can affect worker health and safety. So, in this case, you know, we're talking about weather as well as automation or any of the other technologies that they may be integrating into the mine site.

And so, to frame what we found from our industry discussions, and in this big part of the research roadmap we used these four levels of the system to look at what these development, implementation, and integration facts were. And we actually came, we developed 12 total categories that these gaps generally fell in.

There's a lot of information here, and I'm not going to be able to go through all the specifics. So, I'm going to take the opportunity to kind of pick and choose some examples of what we heard from the stakeholders and what also is present in the data, just to kind of jump in. And, also, because we know that all of these levels of the system interrelate and overlap, we may put things, you know, in a bin just to talk about them, but really they are relevant across the whole aspect.

For example, in the organizational category we see here, you know, we mention workforce. And that talks about the composition of the workforce in terms of gaps. Well, that relates to the workers themselves all across the field.

So, this is just a good way to talk about it and think about it, but not necessarily forcing them to go in one bin or the other.

Diving a little bit deeper into the external level, in general the United States' mining environment is really complex in terms of how it's regulated and what's going on with its communications globally. There's a lot of issues with overlapping jurisdiction. And what we noticed from talking with stakeholders and going out of there, there's a current lack of U.S.-

focused forum.

There are a lot of different bodies, such as the Earth Moving Equipment Safety Roundtable, ICMM, GMM. But, those are often large-company focused and Australian-focused. So, that was one of the big gaps we noticed kind of on the outside moving forward.

If we jump ahead to the organizational standpoint, the data on stakeholders identified gaps related to policies and procedures, communication, as well as workforce logistics. Not surprisingly, 100 percent of the fatalities that we examined in the data had operational failures, and generally more than one.

And when we talk about operational failures, in this case we're talking about there were problems in operating procedures, in authority to operate, fitness to operate, as well as operating compliance, so anything that falls in those levels.

And one example of the concerns that were brought up was with change management. As we were interested in looking into what was going on with technology implementation, one of the big issues that kept coming up was this idea that smaller and medium -- smaller to medium mines could not roll over their fleet one at a time. So, they had a lot of mixed fleet operations.

And that really posed a huge challenge for change management because you now have operators that may operate different vehicles every day, vehicles with different types of technology put on them, and in different areas.

So, it's really a big concern for what's going on in terms of change management. How do you talk to your employers -- or your employees and understand what's going on?

Another gap that was identified in the organizational realm is related to remote operation. It was really interesting as we were talking to some of the stakeholders, they have instituted different policies

where mine workers, such as a dispatch officer, is able to work remotely. That's really advantageous for somebody who wants to work at a big city center instead of the remote location of a mine.

But they also talked about gaps related to the situational awareness of those operators. When they're removed from the mining situation do they really understand what's going on as well as the other workers at the mine? You know, is the benefits and costs, do they weigh out? What should they be doing moving forward? There's a lot of questions related to that from the stakeholders. And it did come up in the data as well.

Looking at the worker level, the data and stakeholders here identified a lot of gaps related to human-centered design, situational awareness, as well as trust. One example of issues related to human-centered design was that the loss of control was actually the initiating event in 33 of the 91 fatal accidents.

So, operators were operating the trucks. Everything -- there were issues but everything was still in control until they lost control of the vehicle. And we're not saying that it's necessarily vehicle design. There's lots of other things that's going on. But that's just to say we need to be aware of what the operators' capabilities are in terms of regaining control and operating these vehicles.

This also came up in talking to the different operators and the different mine workers on site, that they were concerned that things were being designed by engineers and the end users aren't being really talked to or in control with some of these issues. This is not true with everything, but it was just something that we noticed and some of the different operators talked about.

Another example related to the worker level of the system was that -- was in situational awareness. There's really this opportunity as well as a gap to have more information to the people, and really it's

the right information to the right people at the right time.

And one example of this is additional monitoring. We found that in 49 percent of the fatal accidents related to haul trucks that we analyzed, additional monitoring could have helped. And that's related to fleet management knowing what's going on. Oftentimes, these operators, the haul truck operators are driving around. No one's really necessarily paying attention to where they are. And their accident isn't identified until hours later.

Several of the situations could have been mitigated or at least, you know, they couldn't have been prevented necessarily but they could have been mitigated in terms of severity if there was more monitoring that was going on. So, looking into that and improving that is one possible gap that we found.

Moving on to environment and technology, again the data and discussions that we have identified three main themes: infrastructure, interoperability, and data analytics.

And it's really important with respect to environment and technology to make sure that you have a solid backbone to support everything else that's going on in a mine site, which is, you know, understandable. Most people understand this. A lot of this is really common sense, but it's actually following through and working on it, and ensuring that it is the case.

So, for instance, the data actually told us that 57, in 57 percent of the incidents roadway conditions were a factor. So, maintaining, improving, and designing a roadway to meet the specifications of the haul trucks is really important, and something that we need to have in place and ensure that it's solid to enable the smooth running of everything else at the mine site.

Another example is maintenance. You know, this is something else that we've heard time and time again. But in the data set that we looked at, 34 percent of the incidents had maintenance issues as a factor. So,

it's something, again, keep the infrastructure running in supporting the system to make sure that we don't have these fatal accidents continue to occur.

Some of the other examples related to environment and technology are data dead ends. So, when we talk about a systems approach in developing something in isolation, it's really important to understand fully what could happen with the data.

Some of the work, again, related to collision-avoidance systems. We're having these great systems, either warning or information that's being provided to the actual haul truck operator, which is a good safety solution. You know, there are definitely issues with things moving forward. But there's also missed opportunities if this data isn't being aggregated, reported, analyzed.

Specifically to collision avoidance, that data can be used to understand where there are pinch points or issues in terms of traffic management. If the data just ends at the operator, you're missing out on all those extended safety benefits that can be handled at an administrative level and actually prevent accidents on the order of days, months, or years in advance as opposed to these just-in-time type technologies.

So, given all of this discussion and identification of gaps, NIOSH identified 21 action items that we could or should be involved with moving forward. And these action items fell across the spectrum. And, again, these are placed in location where we were talking about them in the report, which when we finish the final policy review is something we can talk to you all in more detail about or have follow-up calls, if we need to, depending on what's going on. But, you'll see that these ideas span across all levels.

And of these 21 action items, we identified five priority action items. And in this case, by priority what we mean is action items that we believe that NIOSH should take the lead on. It's something that we should start as soon as possible because of the

advantage that we, as NIOSH, have for who we are in terms of moving forward. And also to help deal with some of these that have long lead time. So, let's just go through those really quick.

The first priority action item is having a mine automation and emerging technologies partnership. Jessica mentioned this in the beginning of the meeting today. We're already actively working on it. But to help fill that gap of not having a forum for U.S. mining industry, that's something that NIOSH should consider working on.

The next priority action item is related to change management for the implementation of new technologies. NIOSH really has the advantage of being a third party research institution that allows us to look more holistically at the mining industry. In this case, you know, we have a lot of people looking at change management. They tend to be focused towards these large mines because large mines have money to pay for a contractor to come in and help with them. NIOSH can really come in and support the industry in other ways. So, this might be an area where we can feed in and help.

Another one of the priority action items is surface mine wireless communication networks. Similar to the discussion that we were talking about with infrastructure, it's really important as automation is being rolled out that we have a solid communication background. And there are a lot of gaps that were identified by the stakeholders in the data related to that.

As a research organization with a lot of technical background, this is something that NIOSH can help the industry do and support it from the technology standpoint.

Another one of the priority action items is engineering systems thinking. And this is really something that has a long lead time. It takes a long time to change the inertia of the industry to start thinking in a different way and thinking about these

types of problems holistically. And we feel that NIOSH can come in and help change that, that systems, add to that to get people thinking not just about the technology that they're building or the people, but how does everything come together into the mining system.

And the last of the priority action items is related to control or dispatch officer -- operator interface design. And there's really issues with that in terms of where should this operator be? How much workload should this operator have and what's going on with that? And NIOSH actually has a lot of human factors expertise that could potentially look at these issues in the future.

So, here's just an overall football field of what NIOSH and the researchers are currently doing to address some of these issues. If you look in the lefthand column, that's just the action item number that keys into the table that was onto the last slide.

And then we have the projects and activities that are here on the football field.

The first one you see is related to the mine automation and emerging technologies partnership. That's something that's started and ongoing.

Another issue that we can work on, which wasn't one of the priority issues that I talked about, was increased involvement in standard committees and international work groups. That's something that we're actively trying to improve and integrate into all of our projects moving forward.

The next line you'll see with change management and interface design. That's something that we're looking to start as the next project with the team that's currently finishing up this project, which is why it's delayed till the end of this project.

Number 15, addressing the wireless communications in surface mines, Spokane plans on starting a pilot project to see what we can do there. And, hopefully,

that will expand on additional investigation beyond that.

Another one to focus in on, and I think requires a little bit of explanation, is No. 16 here. You see I have two BAAs. This is related to the concept of systems thinking. So, in general, it's sort of a hard idea. You know, what does mine design or ground control necessarily have about systems thinking?

Well, the idea with systems thinking is it's involved in everything. So, despite the fact that it may not be specifically intended to address haul truck health and safety, it will by talking to the different groups that are awarded the BAAs about this idea, about systems thinking.

When you're looking to implement something in mine design, understanding how it fits in not just with the one purpose you're thinking about but the wider range. Mine design is one specific example, very similar to the idea that I spoke about with infrastructure. How are these pieces coming in, and how is a piece of equipment like haul trucks, or haul truck operators, or fleet management systems going to integrate with these projects moving forward.

And so, us, as NIOSH, have the opportunity to engage with these people, working on their specific projects to get them to improve their systems thinking as they do moving forward.

And the last two that are on this specific chart are related to validating a collision avoidance and warning system detection performance. So, looking at that and helping address that issue in the mining industry.

And lastly, we have validating organizational processes to identify and mitigate risk. And this is really our big data project that's going on. It's set at an organizational level and it definitely touches on issues related to haul trucks as we're collecting lots of data from the partners, we can look at this and really understand how it fits in in terms of this

increased monitoring communication with the workforce.

So, given that that's a very, very, very quick overview of the 45-page document that is the roadmap, the question is, What's next? And as I mentioned in the beginning of the presentation, this is sort of the first pass of the project. We now, given all the information that we have learned from talking to people and the data analysis, we're going to move on to the next pieces.

The first part of that is increasing our engagement, which I talked about in the football field. We're going to make sure that we're still communicating with the industry, and have special attention to international groups and standards participation so we're not losing touch with that.

The other two tasks that are remaining in this project are looking at the cognitive aspect of haul truck health and safety as well as technology readiness, to be able to bring everything together and update this document and then move on to a new proposal which is planned.

And given that, I wanted to just give you a little bit more information about the cognitive piece. In the data that we analyzed in haul truck-related fatal accidents, many of the operators failed to follow procedure -- failed to follow policies and procedures. And this was actually the case in 84 percent of the incidents, which is a huge number.

But, unfortunately, there's not a lot of information about what happened during the accidents. The vast majority of these accidents the operators themselves passed away so we can't talk to them afterward, and we're just not sure what happened. We don't know what motivated the operators' decisions. And it's still a little bit unclear in a lot of places what can be done to mitigate and prevent these accidents from happening.

So, as a part of that cognitive task analysis, we're

actually talking to operators as well as managers, safety directors, and people in maintenance departments, different ancillary departments to understand what is driving these haul truck operators and what is driving the support system around that. That will give us some more insight into this decision making and understand it from a systems approach so we can fill in and update the haul truck roadmap to see if there's anything we're missing in terms of gap or directions we may need to change or add onto moving forward.

And what I'd like you to take away from this presentation is that through this initial evaluation and moving forward, we believe that it's really important that the industry needs to systematically develop, implement, and integrate haul truck-related health and safety interventions. Again, it's still a huge problem in the industry. And if we just work to get the interventions implemented fully and correctly for all the situations, we can improve our health and safety gains by looking at it from a holistic approach.

So, thank you very much for your attention and your time. Do you have any questions?

Member Luxbacher: I've got one, Jennica.

All right. When you talk about your priority item around change management, could you give me some examples? I mean, I could see it being sort of a 30,000 foot view when you're applying management theory to automation changes, or more like a case-by-case intervention or assistance type of thing?

Ms. Bellanca: So, it's a couple issues. And that's something we're still actively working on, which is why the proposal is not fully developed. So, I think it will be informed by the cognitive task analysis work that we're doing.

One of the big questions that we identified with respect to that is this whole idea of mixed fleets. So, we have a lot, like, there's many companies out there

that are third parties that come in and help with change management and help understand that. But a lot of the question is how do we apply this theory of change management to these more mixed fleets and smaller case-by-case basis?

So, we're not looking to reinvent change management. There's a lot of work that's done by that, and actually a lot of expertise is held within NIOSH specifically. We've done projects on it in the past. It's more of applying it to this, these more specific situations and understanding how it fits in.

Does that make sense?

Are there any other questions?

Chair Burgess: Any other questions for Ms. Bellanca?

(No response.)

Chair Burgess: All right, Jennica, thank you very much. Interesting presentation.

Ms. Bellanca: Thank you.

Chair Burgess: Look forward to hearing more about the projects you select later on.

Okay. Now, we've completed our regular scheduled presentations. We're at the point of public comment. And I'd like to look to Jeff Welsh to see how he would like us to go forward with those.

I know that there were some comments that were put forward. And who should go, Jeff, who should go through that? Is this something you want me to do? Is that something that you would bring up?

Mr. Welsh: Why don't you ask the public now, whoever's on, if they have a question.

Bob, how did you have that set up to do?

Mr. Randolph: Well, they cannot speak unless we acknowledge them. There's just too many attendees.

But they can type in text questions. And if we really need some more intense call-up, then we can individually allow attendees to speak.

Chair Burgess: Okay. In that case, Jeff, I suggest I just go through some of the questions that we've received so far. And we can see how much time we have available.

Mr. Welsh: Okay.

Chair Burgess: So, one question is whether the slides will be available from this meeting. Jeff?

Mr. Welsh: We post the meeting minutes and associated materials to the MSHRAC internet site, and we can also make the slides from the meeting available.

Chair Burgess: Okay. Thank you, Jeff.

Then the next question was about the FAST process, whether that had been approved by MSHA specifically as an acceptable method?

Dr. Kogel: So, I'll take that one, Jeff. This is Jessica.

So, FAST is not designed for regulatory compliance. But it was designed for operators really to use it for self-assessment of their engineering controls and to really understand where workers have a high potential for exposure.

So, I guess the answer to that question is no, because it is not designed for regulatory compliance.

Chair Burgess: All right. Thank you, Jessica.

Next question would be for Bruce. Is there any coal gasification in the works in the U.S.?

Mr. Watzman: Unfortunately, there isn't. It's just not economic today. It's been looked at repeatedly. It was looked at when oil prices were well, well north of \$50 a barrel. But with the amount of fracked gas that exists in the country, the forward-looking market

price for gas, coal gasification just doesn't cut it these days from an economic standpoint.

The technology is known but the economics aren't there.

Chair Burgess: Good. Thank you, Bruce.

All right. And moving on into the Q&A section of the Zoom website, so there are a few questions here.

One was for Jessica. If there's any unique COVID guidance for underground mines that was available?

Dr. Kogel: So, right now we have two information sheets. I believe they are posted now. I haven't checked today. If they're not posted yet, they will be soon because they have been cleared through CDC. One of those flyers is for miners with preexisting conditions. And the other flyer addresses general mining.

And then in addition to that, we also have a web page on the CDC website that has different guidelines for miners. And, so, really none of them are necessarily specific to underground mining per se, but they do encompass underground as well as surface mines.

Chair Burgess: Great. Thank you, Jessica.

I think this question is for Jennica, I believe.

It's have you assessed the role of fatigue and impairment in deviating from training and established procedures?

Ms. Bellanca: Yes. That was one part of our analysis with the haul trucks fatal accidents. Because of the inconsistency of inclusion of toxicology reports in the fatal accidents, it's something that I don't know that the numbers really speak accurately to. But it is something that we're addressing in our interviews and we'll have more information.

But it's definitely a problem that we've noted, and something that will be included in the final report.

Chair Burgess: Good. Thank you, Jennica.

And here's a question for Steve. What type of toxicity testing will be undertaken on the elutriated EMP? For example, will rodent inhalation toxicity testing be undertaken or pleural injections be used?

Dr. Mischler: Yes, at this point I don't think that we have any respiratory or, airborne toxicity experiments to be run. We did have some good news recently that we put together a NORA proposal with our health partners that was accepted for full proposal. So, if that gets funded, then it will open up to a much larger array of toxicity tests.

But for now it's just going to be intratracheal instillations and cell, cellular studies.

Chair Burgess: Great. Thank you, Steve.

Are there any other questions from the public or public comments?

I'm looking at the Q&A right now. Do you have anything?

(No response.)

Mr. Randolph: I believe we covered everything in the Q&A and the chat.

Chair Burgess: All right. Thank you, Bob.

I'm not seeing anything else being written. So, we'll go ahead and close out the public comment period.

Member Zimmer: Jeff, I just have one. I'm thinking about Jennica's presentation. Of the haul truck accidents was the majority of those rollovers or what type of accidents were they, the dynamics?

Ms. Bellanca: The majority of the accidents were actually loss of control. So, that's including driving off the edge, and going back over the berm, in terms of what they actually were.

I have a couple of graphs and other things I could pass on to the committee. I had a presentation in SME this year that I would refer you to, too, that looked at the breakdown of the accidents. And then in addition to that, about 25 percent were also collisions. So, there's a pretty even -- there was, you know, we have loss of control as most and then have the collisions that comes next.

Member Zimmer: Okay, thank you.

Chair Burgess: All right. Let's go ahead and move on to our last topic, which is committee discussion on future agenda topics, location, and dates.

It's a little bit hard in our world of COVID right now to figure out when the next in-person meeting will be. But I think it would be reasonable to set a date, or at least a month for our next regular committee meeting, assuming that it would be online, and to choose the discussion topics.

So, why don't we start with the topics first and then go to the meeting location or dates.

So, from the committee members, are there particular topics that we need to have covered at the next meeting?

Member Bowersox: This is Ron.

Chair Burgess: Okay, Ron.

Member Bowersox: I believe we need to definitely continue our COVID-19 issues for sure.

Chair Burgess: All right. Thank you, Ron.

Is there something particular about COVID-19 that you'd like to hear?

Member Bowersox: It changes so much. You know, just keep updating as it changes in workplace safety, distancing. I know it's a big issue in the mining industry because distancing is hard, it's hard to keep to six foot. Just continuing updates, that's all.

Chair Burgess: Thank you.

Dr. Kogel: Ron, this is Jessica. So that we can prepare for that, today I just really gave a very high level overview. So, it sounds like you're really looking for something that would be maybe more detailed in terms of what the current guidelines are for mines.

Is that really what you're looking for?

Member Bowersox: That's correct, Jessica.

Dr. Kogel: Okay. Thank you.

Chair Burgess: Are there other requests for future topics from the committee?

Member Luxbacher: So, if I understand right, the restructuring will probably be official, right, when we next meet, usually in November?

Dr. Kogel: Yes. If we meet in November our plan is to stand up the new organization on October 1st. So, yes.

Member Luxbacher: So, a little update on that, doesn't have to be more than a couple of slides, but that would certainly be of interest.

And I always like to hear what's going on with the external programs, too. The extramural research --

Dr. Kogel: Thank you, Kray.

One of the things I didn't mention when we started this meeting is because of the shortened time frame we deviated a bit from our normal meeting agenda. So, I only did a 10-minute update and I didn't have the directors for the two divisions present. And I didn't have the presentation that George usually gives on the extramural program.

So, my expectation is if we are meeting in person that we would go back to the normal format. But I

suppose, too, if we have to continue in a, remote sort of setting we could also maybe have a slightly longer meeting and have some of those regular updates if the committee would like them.

Member Luxbacher: Well, I do want to say this meeting has been excellent, I think, so well organized. And Jeff, and Jeff, and Jessica, just appreciate your leadership.

Dr. Kogel: Thank you. Thank you all for sitting in front of a screen.

Chair Burgess: One response to what you just said, Jessica, is that for Zoom meetings it becomes difficult, I think as you mentioned, or at least others have as well, to sit for a long period of time.

So, my personal feeling is that if we do have the next meeting as a Zoom meeting that we try to keep it to around four hours, as this meeting has been. It's just really hard, at least for me, to pay attention much beyond that time period.

And if there was a need for a longer meeting, then you could do what was, what at least one of the other meetings planned was going to do which was to have it on two consecutive days but having a shorter number of hours for each.

But that's what I'd recommend. But, you know, we can figure out what's needed based on the material that we'd like to hear.

I heard Kray ask for some additional information, on the extramural program. And I'd also like to add to that a bit more information on what BAAs are planned as well and, how that process will be carried out, what you'll focus on.

Are there other requests for topic items for the next meeting?

Member Zimmer: Jeff, if you want to do something on suicide prevention, we had a segment in our

webinar a couple of weeks ago that Jessica participated in. Maybe we can have a guest speaker come in for 15, 20 minutes and talk about suicide prevention, signs and symptoms, or things along that line if, the committee would like something like that where they could, get some resources out to different people, different stakeholders.

Chair Burgess: Great, Kyle. Thank you. We have that recorded as a request. I think that's a great idea.

Any others?

Member Wright: Yes. It was interesting to hear Bruce's discussion of the coal industry today. And although it's not exactly safety and health research, it certainly informs safety and health research. By then we should know more about the impact of COVID-19 on the economy. And it might be interesting if we could maybe have a review of other commodities and what the forecast is for them.

Chair Burgess: Okay. Noted. Thank you, Mike.

Member Zimmer: I've got a question for Jessica. What's the progression of the experimental mine? Did we purchase that? Did that go through or did NIOSH purchase that?

Dr. Kogel: So, Kyle, I mentioned at the end of my presentation that the owner of the site has accepted the government's offer. So, right now there is an environmental impact statement that has to be completed. That will be the final EIS.

And so, depending on the outcome of that and whether or not there are any environmental issues that are discovered during that process, that will determine whether or not the sale will go through. So, it's really contingent on the completion of that and addressing the issues that come up.

Member Zimmer: Thank you.

Chair Burgess: Any other suggestions for topics for

our next meeting?

One thing that I'd be interested in hearing about, it doesn't have to be the next meeting but perhaps for some future meeting, is a bit more information on the communications specialists that you're bringing out, at least to Spokane, and it sounds like perhaps to other locations, with the Fellowship Program. And perhaps if it fits into some of the presentations, a little bit more about how you plan to use case studies for communication.

Not hearing any other suggestions, let's move on to the timing of the meeting.

So, we, as was mentioned, we generally have meetings in the spring and in November. That has worked pretty well to not interfere with other meetings. I see no reason not to follow along that schedule. But the committee is certainly willing to hear other alternatives.

Does anyone feel that -- let's have a general response to having our next meeting in November. If people could just -- I see one thumbs up.

Is anyone, would anyone prefer a meeting time other than November, please say so.

(No response.)

Chair Burgess: All right. So, we'll have our next meeting in November.

So, I guess the next question would be how long it should be. Does anyone have any concerns about or would anyone have any other alternatives to limiting it to approximately four hours per day with either one or two days, depending upon what NIOSH can pull together?

Member Wright: That sounds like a good strategy.

Chair Burgess: Thank you, Mike.

Any other feedback on that?

Member Bowersox: I'll just say that I think the four hours like today's meeting is great.

Chair Burgess: I agree, Ron. I think shorter is better. It's easier to keep one's attention.

And certainly, again, Zoom, there is some Zoom fatigue.

So, let's go for one 4-hour meeting, if we can, with the option for an additional day if necessary. And we can work with NIOSH to figure out which of the topics that were just requested would fit nicely into that package.

So, any final comments, thoughts, before we adjourn?

Dr. Kogel: Jeff, I'd just like to thank the committee for experimenting with today's format. And I really appreciate the feedback that you've given us and that it was successful, and everybody's input and engagement and their commitment to all of this is really appreciated by me and I think everybody at NIOSH. We do really benefit from your views and your input.

So, I also wanted to thank the speakers for their excellent presentations.

And I think everybody probably noticed we had, we had, 120 attendees at one point, or maybe even a few more. So, I really appreciate the interest and support of all of the attendees, which is a combination of NIOSH people as well as, public attendees. So, I want to thank them.

And I want to thank all of my NIOSH colleagues who participated today and for all of the contributions that they made to the work that we were able to present to the committee. So, I just wanted to thank everybody.

Chair Burgess: All right. And I'd like to thank everybody as well who presented today, and the

committee members for their time, and everyone from NIOSH who can participate in this process.

With that, unless I'm hearing, unless I hear anything else, today's meeting is adjourned. And we will provide information for you on the next meeting as soon as the schedule is developed.

Thank you, everyone.

(Whereupon, the above-entitled matter went off the record at 1:49 p.m.)