

**THE UNITED STATES DEPARTMENT OF HEALTH AND
HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION**

**NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND
HEALTH (NIOSH)
MINE SAFETY AND HEALTH RESEARCH ADVISORY
COMMITTEE (MSHRAC)**

**SPRING MEETING
NIOSH MINING PROGRAM
TRIDELPHIA, WEST VIRGINIA
HYBRID IN-PERSON AND ZOOM, OPEN TO THE PUBLIC
WEDNESDAY, APRIL 17, 2024**

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Summary Proceedings

The Spring 2024 meeting of the National Institute for Occupational Safety and Health (NIOSH) Mine Safety and Health Research Advisory Committee (MSHRAC) was convened at the MSHA Approval & Certification Center, Triadelphia, West Virginia, and via Zoom, on Wednesday, April 17, at 8:30 a.m. EST, Kyle Zimmer, Jr., Chair, presiding. The meeting was also open to the public by video teleconference.

Attendees

Members Present In-Person or Via Zoom

Kyle Zimmer, Jr., International Union of Operating Engineers; Chair

Kristina Behringer, M.D., Cheyenne Physician Group

Ronald Bowersox, United Mine Workers of America

Tom Duffy, United Steelworkers of America

J. Todd Moore, CONSOL Energy

Elizabeth “Libby” Prichard, National Stone, Sand & Gravel Association

Steven Schafrik, University of Kentucky

Matt Stewart, R.T. Vanderbilt Holding Company, Inc.

Ex Officio Members Present

Giovanna Biscontin, National Science Foundation, Ex Officio

Melanie Calhoun, Mine Safety and Health Administration, Ex Officio

Danielle Carlin, NIEHS, NIH, Ex Officio

Invited Non-Members Present (In-Person or Virtually)

John Howard, NIOSH Director

Christopher J. Williamson, Assistant Secretary, Mine Safety and Health Administration

George Luxbacher, NIOSH Deputy Associate Director for Mining

Steven Mischler, NIOSH Designated Federal Official

Pauline Benjamin, NIOSH ODDM, Committee Management Specialist

Robert Randolph, NIOSH Mining Program Shared Services Director

NIOSH Spokane Staff

Doug Johns, Director, NIOSH Spokane Mining Research Division Director

Cara Halldin, NIOSH Spokane Mining Research Division Deputy Director

NIOSH Pittsburgh Staff

Steven Sawyer Jr., NIOSH Pittsburgh Mining Research Division Director

Carin Kosmoski, NIOSH Pittsburgh Mining Research Division Deputy Director

DFO Introductions, Announcements, Roll Call

Dr. Steven Mischler

Senior Research Scientist

**National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention**

Dr. Mischler, as the Designated Federal Official for the Committee, called to order the open session of the Spring 2024 meeting of NIOSH MSHRAC at 8:31 am Eastern Standard Time (EST) on Wednesday, April 17, at the MSHA Approval & Certification Center (ACC), Triadelphia, West Virginia and via Zoom. A roll call of all MSHRAC members confirmed that a quorum was present. The roll was also called following each break and lunch to ensure that a quorum was maintained. A quorum was maintained throughout the day.

No conflicts of interest (COIs) were declared. Committee members were instructed that if a conflict of interest came up at any time during the meeting, they were to declare that conflict and recuse themselves from any discussion or voting on that matter.

Members of the public on Zoom were notified that they would only be able to listen to the meeting, not comment or ask questions, until the Public Comment period, scheduled at the end of the presentations, although questions could be submitted online via the Zoom chat feature at any time, to be addressed during the Public Comment period.

Dr. Mischler welcomed everyone and briefly reviewed the structure and history of MSHRAC, initially established in 1969; this meeting was the 92nd NIOSH meeting of MSHRAC, now in its 54th year. This was the first meeting held at the MSHA ACC, Triadelphia, West Virginia. Dr. Mischler thanked MSHA for hosting the meeting and Todd Moore for providing the committee a tour of a longwall mine and then reviewed the agenda for the meeting.

Chair Remarks, Approval of Minutes

Mr. Zimmer, MSHRAC Chair, welcomed the Committee members. Mr. Zimmer then asked for an approval of the minutes from the prior meeting. Mr. Bowersox made the motion, seconded by Mr. Duffy. The floor was opened for discussion and the motion was then approved. Mr. Zimmer then introduced Dr. Howard for his remarks.

NIOSH Director's Remarks

Dr. John Howard, MD

Director

**National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention**

Dr. Howard thanked the members of the Committee for their service on MSHRAC and expressed his appreciation to both the Committee and the Mining Program leadership and staff. He also welcomed Chris Williamson and thanked the MSHA ACC for hosting the meeting. He then congratulated Chris and the entire MSHA team for their great success in finalizing the silica rule and added thanks to the NIOSH team, from George Luxbacher in Mining to David Weissman in the NIOSH Respiratory Health Division for helping with the final rule. Dr. Howard then discussed the passing of the fiscal year 2024 budget at the same funding level as fiscal year 2023. He mentioned that the implications of a flat budget with increasing costs associated with cost-of-living increases for personnel salaries, costs associated with the NIOSH working capital fund and increasing amount of money spent for IT transformation. He continued explaining that the result of a flat budget and increasing costs means NIOSH needs to optimize both administrative costs and by looking across programs and pausing or eliminating specific projects that are not achieving desired results. Dr. Howard concluded by mentioning that the search for the Associate Director for Mining is underway and job was posted on April 15th. Chair Zimmer thanked Dr. Howard and asked if there were any questions and then introduced Mr. Chris Williamson and thanked him for attending the Total Worker Health kickoff meeting at a quarry in Connecticut and mentioned that the membership really appreciated his attendance.

Comments from the Assistant Secretary Labor; Mine Safety and Health Administration (MSHA)

Christopher J. Williamson

Assistant Secretary of Labor

Mine Safety and Health Administration

U.S. Department of Labor

Mr. Williamson thanked Chair Zimmer for his introduction and began his remarks discussing the new silica rule. He thanked Dr. Howard, Dr. Weissman, and Dr. Luxbacher for leading NIOSH assistance with the rulemaking and mentioned the introductory event, in Uniontown, PA, that featured miners from the iron range in Minnesota and the trona fields in Wyoming. Mr. Williamson continued with discussing how MSHA plans on providing compliance assistance and answering questions from the mining industry on preparing for the rules implementation. He noted how it is important that the entire mining community work together and focus resources towards the common goal of keeping miners safe and healthy. Mr. Williamson then discussed the concern in the mining community around the high number of fatalities last year. He mentioned that everybody needed to focus and work together to make sure that the miners are the first priority and concern and when that is done it is possible to greatly reduce, with the goal of eliminating, fatalities in the mining industry. He concluded by discussing the success of the Connecticut total worker

health event and the importance of total worker health in keeping the nation's miners healthy. He thanked Mr. Zimmer for his leadership on this issue, then asked if there were any questions.

Member Moore commented on the success of the event in Uniontown, PA, and then asked how MSHA was planning to provide assistance to the mining industry for compliance to the silica rule. Mr. Williamson replied that MSHA was still working out details but there will be robust compliance assistance, including stakeholder meetings and possibly an industry-wide committee, similar to the committee for working out issues with the continuous personal dust monitor (CPDM). Member Moore expressed confusion on when the rule would be triggered, and Mr. Williamson clarified that issued and emphasized that MSHA will work with all stakeholders to ensure successful implementation of this rule. Member Stewart then echoed Member Moore's concern about the difficulty in complying with this rule and the need for compliance assistance. He also wondered about the creation of a subcommittee to work on compliance issues. Dr. Luxbacher mentioned the respirable mining dust partnership with MSHA and NIOSH and that the partnership could be re-engaged if there was interest. He then mentioned that a subcommittee on this issue would not make sense since the obligation is to give recommendations to the director of HHS, CDC, and NIOSH on research.

Dr. Luxbacher continued by discussing the research projects on respirable coal mine dust and respirable crystalline silica that are funded by NIOSH, including work on measuring silica on the CPDM filter. Member Stewart agreed that there is a lot of NIOSH research with little public visibility and that using the established MSHA/NIOSH partnership is a good idea. Dr. Luxbacher then mentioned that NIOSH did many workshops for stakeholders after the promulgation of the diesel rule and perhaps NIOSH could also help in this way. Mr. Williamson agreed that the NIOSH/MSHA partnership could be used to help with rule implementation. He also mentioned that MSHA would work to speed up any approval process for real-time technology to measure exposure. He added that the rule should help create a market for monitoring technology and that may stimulate industry to improve monitoring technology. Dr. Luxbacher mentioned that regulation can drive the market and this was described in the RAND report, "Barriers to the Commercialization and Adoption of New Underground Coal Mining Technologies in the United States." Member Moore added that industry is much more compliant with the CPDM because it allows miners to make adjustments immediately to reduce exposure. He then asked if MSHA has any plans for a national education plan for miners, emphasizing that there has been a major change in the mining workforce in recent years, and this creates an opportunity to educate these younger miners. Mr. Williamson agreed and added that improved training could come from both the agency and the industrial partners.

Mr. Williamson continued that we have known about the hazards of silica for many years and that silicosis is preventable and everyone needs to work together towards eliminating this occupational disease. Member Moore added that it is necessary to improve the approval process to persuade more companies to enter the mining market for safety equipment. Mr. Williamson agreed that this is an issue that the agency will work on. Mr. Luxbacher mentioned he was surprised, considering how CONSOL pushes safety, that few employees were wearing breathing protection during the longwall visit. Mr. Williamson added that everyone needs to play a role, including labor, by educating members on the importance of respiratory protection. He noted that adding surveillance

provisions in the role focusing on the metal/nonmetal industry was important. Member Calhoun added that it is also important to speak with older miners, especially on Title 30 of the Code of Federal Regulations (CFR) Part 90, and to help them understand their rights and feel comfortable exercising their rights under this provision. Member Bowersox added that Pennsylvania has a low number of Part 90 miners, and he believes the reason is fear of losing their job. Dr. Luxbacher concluded the discussion by mentioning that NIOSH is funding a research project evaluating reasons people decide to not wear respiratory protection and asked for support from member's organizations in this effort.

Report from the Deputy Associate Director for Mining

Dr. George Luxbacher

Deputy Associate Director for Mining

**National Institute for Occupational Safety and Health
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With the absence of an Associate Director for Mining (ADM), Dr. Luxbacher presented a brief update on the Mining Program projects, MSHRAC membership, the Society for Mining, Metallurgy & Exploration (SME) contract that is a followup to the RAND report. He started his presentation discussing the "smart cab" created under NIOSH research funding and how this system can help reduce dust exposures. He then discussed MSHRAC membership and how long and complex getting members approved can be and welcomed two members that were renominated and recently approved, Andrea Brickey and Marifran Mattson. He continued that in 2025, due to the difficulty in seating members, technically the committee may only have one member, with the terms for all current members but one expiring in 2024.

Next, Dr. Luxbacher discussed the ADM announcement and asked the committee to forward to all interested parties, as well as discussing the Federal Register Notice announcement for MSHRAC committee members. He continued his presentation by thanking CONSOL for an excellent mine tour and presented some history on longwall mining. He then mentioned the RAND report and thanked the participants and organizers of the meeting occurring the next day. He continued that these meetings have given NIOSH a better understanding of the barriers to the implementation of technology in mining.

Dr. Luxbacher continued with a discussion concerning the creation of a NIOSH center for critical minerals and how the Mining Program will focus on both the health and safety aspects of critical mineral mining, processing, and recovery from waste. Member Stewart asked about funding and Dr. Luxbacher responded that initially this will be funded with existing resources but eventually the hope is to add funding from the Department of Energy and the Department of Defense. Then Dr. Luxbacher discussed the establishment of NIOSH science priorities and that Dr. Howard wanted to have input from all NIOSH DLOs. Dr. Luxbacher then discussed NIOSH intramural programs at SMRD and PMRD and extramural programs which address these priorities, including data modernization and mining robotics and automation safety, and how NIOSH is working with partners such as global mining guidelines group, NASA Jet Propulsion Laboratory (JPL), the University of Kentucky, and the University of Nevada-Reno on projects under these priorities.

Dr. Luxbacher closed the discussion mentioning that NIOSH leadership is working on new branding for the NIOSH Mining Program, along with the creation of the Jessica Kogel Mining Health and Safety Scholarship. Dr. Luxbacher then asked for questions. Mr. Williamson commented that they had a very good conversation at the SME meeting in Washington DC on barriers to technologies in mining and that he is glad this conversation is continuing this week and that the perspective of labor is being discussed as well.

Report from Chief of the MSHA Approval and Certification Center

Juliette E. Hill

Chief, Approval & Certification Center

Mine Safety and Health Administration

U.S. Department of Labor

Juliette Hill presented on the MSHA ACC, both the work and procedures. She began with a brief introduction of her work history, thanking MSHA leadership and employees at the center and by presenting the MSHA mission. Ms. Hill described that the ACC is focused on both providing technical support to the mining industry, accident investigations, as well as approval of equipment for use in underground coal and gassy underground metal/nonmetal mines. She then explained the makeup of the ACC (5 divisions) and the work focus of each division and how the approval workforce has been decreasing over the last 5 years. Ms. Hill explained that they complete their work using the regulations, criteria documents, and standard test procedures based on these regulations.

Ms. Hill explained the application approval process from the beginning to end, starting when the manufacturers submitting their application for MSHA to establish a fee estimate and ending with the certification letter. She continued that the first step of assigning the work to an MSHA engineer can take 1 year due to the lack of available technical staff and the current number of applications in line for approval. She explained that applications are ordered by priorities and the highest priority applications jump to the front of the line while the non-priority applications are completed as time allows, generating a backlog. She continued that once the application is assigned to an engineer, that engineer will work with the applicant to ensure the application is complete. This step often takes much time with back-and-forth communication with the applicant. She then discussed the fee and how the engineer will issue an estimate, based on hours they believe it will take to fully test the equipment. The applicant then has a choice to continue or end the process based on this fee estimate. If the product testing takes more effort than initially estimated, the engineer will notify the applicant and ask if they should proceed. If the product fails a test, the engineer will reach out to the applicant making them aware of failure and what parts need to be redesigned. The redesigned product will then be tested under the Revised Approval Modification Program (RAMP). If the applicant does not respond to MSHA's requests adequately, MSHA can cancel the application and only charge the applicant for the cost to date.

Ms. Hill concluded by saying that MSHA provides consultation and assistance for companies applying for approval and recently held a workshop on the process to further educate potential applicants and then asked for questions. Member Moore questioned the loss of technical positions at the ACC and wondered why they could not replace them. Member Calhoun said the lack of

funding made it hard to hire new employees. Mr. Williamson added that MSHA has been flat-funded for years, so with increasing costs and flat funding the result in fewer positions. He continued that most MSHA activities are mandated by law—inspecting mines, investigating accidents, etc.—and so it is important to understand why MSHA has cuts in certain areas. Member Moore asked if there has been a downturn in applications in recent years and Ms. Hill responded yes, but that recent supply chain issues have caused many suppliers to seek additional sources for components, and all these changes require approval.

Member Moore asked for an average length of time to complete an application. Ms. Hill responded that this is very case- and personnel-dependent but that it takes approximately a year for the application to be assigned. Ms. Hill then mentioned that it takes 3 or 4 years before a newly hired engineer is able to work independently on these applications. Member Moore then questioned how MSHA intends to solve issues such as approving powered air-purifying respirators (PAPRs). He continued that MSHA is very interested in reducing respirable dust exposure, but equipment that can be used to reduce this exposure cannot get approved for use in underground coal mines. Member Calhoun responded using 3M as an example applicant—that once they saw the cost of the effort, even with MSHA waiving certain fees, they decided against going through the approval process because of the small mining market. Member Moore responded by saying that 3M did not believe they would pass approval. Dr. Luxbacher mentioned two other suppliers of PAPRs that also did not initiate the approval application for the same reason. Ms. Calhoun replied by saying that each case is different and that MSHA does not purposely try to make the process difficult, but they continue to try to improve the efficiency of the process. Dr. Luxbacher asked several questions concerning the MSHA fee structure, improving the RAMP process and 30 CFR Part 56 Subpart O. Mr. Shumaker responded that Subpart O should have the manufacturer receiving MSHA approval before sending NIOSH for approval to help cover increased costs.

Member Moore then asked if there was any discussion with MSHA about recognizing international standards for intrinsic safety, as long as they provide equal or better protection. Dr. Luxbacher responded that NIOSH did some work on comparing these standards but ended that work since there was no path forward. The conversation continued between members and MSHA concerning details of 30 CFR Part 18 and approval of PAPRs and agreeing that no regulation can be promulgated if it diminishes safety. Member Schafrik added that it is necessary to educate the mining community on this topic because there is a chilling effect on companies developing new technologies for mine, believing that their technology cannot get through the approval process, or they decide to go in another direction with the work. The discussion ended with comments by both members and MSHA about how this approval issue along with the small available market reduces the amount of new health and safety technology in mining.

SMRD Overview

Dr. Doug Johns

Director, Spokane Mining Research Division

National Institute for Occupational Safety and Health

Centers for Disease Control and Prevention

Dr. Johns introduced himself as the Director of the Spokane Mining Research Division, thanked MSHA for hosting the meeting, and noted that he and some of his staff had toured the facility last year. He also thanked Todd Moore for taking the group on the mine tour as well as MSHRAC for their advice and level of interaction in choosing to convene twice a year. In introducing his presentation, Dr. Johns noted that he would be providing some updates on specific areas of research within the Division, as well as an organizational update and overview of SMRD given that the work of all Division staff directly contributes to the advancement of research to protect the health and safety of miners. Dr. Johns provided a brief history of the Division including the recent reorganization in which the Miner Safety Branch and a Miner Health Branch were established.

Presenting a slide with the Division's major programmatic research areas, Dr. Johns noted the continued importance of the historical focus of the Spokane Laboratory in ground control and seismicity and stability research, while also recognizing the imperative to stand up new research in automation and miner health. He then provided an overview of the uncertainties associated with conducting basic and applied research to lead into the Division's approach to conducting research, emphasizing impact while encouraging the integration of innovation and creativity. All projects within the Division undergo formal internal reviews twice each year, though Division leadership is frequently updated on research progress along with any roadblocks that may require minor modifications. Dr. Johns provided updates on some of the research and research plans in two of the Division's newer areas of research. Highlighting work within the Division's Automation and Technology Team led by Bob Bissonette, Dr. Johns provided an overview of two current projects—"Machine Situational Awareness" and "Coexistence of Safety and Wireless Systems in Mining"—noting that both projects have made incredible progress in a short amount of time. Under the leadership of Kendra Broadwater, the Division's new Exposure Monitoring and Control Team is developing a proposal to investigate exposure assessment needs in metal and non-metal mines, and Dr. Johns expressed enthusiasm with the potential for this project to evaluate novel approaches for assessing exposures.

Noting that summaries of all Division projects are included in the booklet prepared for the Committee, Dr. Johns presented three slides listing all current projects within the Miner Safety Branch and the Miner Health Branch, along with plans for potential future work within the Division. He provided brief status reports on a few of the projects within each Branch, including: the impact of heat strain on cognitive function in miners, tailoring opioid hazard awareness training resources for the mining industry, developing a framework to identify and address job hazards unique to women in mining, managing ground support for long-term stability in underground mines, and rockfall catchment design and slope performance at surface mines. Dr. Johns described the Division's strategic planning efforts and how the Division and Branch strategic plans help inform ideas for future projects in the next five to ten years. Mentioning his background in conducting human health science and risk assessments, Dr. Johns discussed the potential for subject matter experts within the Division to work with PMRD and other parts of NIOSH to formally evaluate the health effects of exposure to critical minerals, and he sought input from the Committee on conducting such an assessment. He then went through various ways the Division has provided research updates to the Committee over the past several years, noting that he is more than happy to present additional detail in a particular area of research in future meetings.

Presenting a slide with photos of SMRD researchers conducting laboratory and field work over the past few years, Dr. Johns noted that he has asked the Division to take a few more of these pictures over the next several months to share with the Committee during the next MSHRAC meeting.

Acknowledging the mission and focus of the Mining Program and SMRD to protect the health and safety of miners, Dr. Johns noted that Division staff support the missions of NIOSH and the CDC in other ways as well. He specifically mentioned Brianna Eiter's role in serving as the co-chair of the NIOSH Institutional Review Board (IRB) for the past several years, Zoe Dugdale's role in serving as the assistant coordinator of the NIOSH Center for Work and Fatigue Research, Carol Nixon's support to NIOSH in project and program evaluation, and Jerry Poplin's diligent work to find an appropriate mechanism to reimburse human subjects for their participation in research that would benefit not just SMRD, but divisions throughout NIOSH and the CDC. Dr. Johns also described other high-profile efforts in NIOSH and CDC that were supported by SMRD employees, including the development of a wildland fire smoke hazard assessment for workers, coordinating the implementation of the CDC Data Modernization Initiative, as well as providing support through public health deployments for various public health emergency responses.

Dr. Johns described two annual meetings that SMRD has established in recent years: a division-wide retreat held each September that includes everyone in the Division and a State of SMRD meeting held in January with Division federal employees. He then went through several slides that he had presented to the Division during the most recent State of SMRD meeting held January 25, 2024. In that meeting, he reminded the Division of the mission of the CDC, NIOSH, and SMRD, as well as the Mining Program strategic goals, and his core principles for SMRD which include respect, creativity, growth, and accountability. Dr. Johns mentioned that just a few days prior to the most recent State of SMRD meeting, the Director of the CDC, Dr. Mandy Cohen, had shared with CDC Division Directors her 2024 priorities for CDC. He noted that several of these priorities overlapped with the work of SMRD, including lab quality, safety and innovation, heat and health, suicide and overdose prevention, maternal and women's health, and maintaining a world class, diverse workforce.

Recounting the history of SMRD, Dr. Johns discussed the Division's recent reorganization and presented a slide with the changing numbers of Division employees over time, noting the Division has had to be flexible in its hiring because of changes in SMRD's budget. Recently, the Division received targeted funding from Congress intended to grow the Division and its research. As a result, the Division had an ambitious hiring plan for this year, and Dr. Johns presented a table with vacancies SMRD has recently announced or is planning on announcing during the next year. Dr. Johns then presented several slides related to the Division's continuous improvement efforts involving input from all employees. Some of this is informed by encouraging employees to participate in the annual Federal Employee Viewpoint Survey and developing an action plan based on the results of the survey. Dr. Johns briefly described the survey and presented some of the Division's most recent results, noting significant overall improvement in the past several years, along with some areas where the Division is hoping to improve. He then briefly discussed ways in which the Division recognizes its employees, including the establishment of a Division Director's Award and a peer-nominated SMRD Guiding Light Award.

Dr. Johns ended his presentation with a slide outlining his approach to leading SMRD, noting that his primary role is to maximize the impact of the Division's research to protect the health and safety of miners, while establishing a culture and maintaining an organization that fosters and encourages employee engagement and professional development. He thanked the Committee and asked if there was time for questions. Committee member Calhoun and Assistant Secretary Chris Williamson asked what the Division had done to improve their Federal Employee Viewpoint Survey scores so markedly. Dr. Johns responded that much of it was due to having established leadership after an extended transition period when the Division was first created and noted the importance of transparency and accountability.

Committee member Stewart thanked Dr. Johns for a great presentation and asked if Dr. Cohen had visited the CDC facilities in Spokane or Pittsburgh. Dr. Johns said that Dr. Cohen had not yet been to a NIOSH facility, noting that she had been in her position for less than a year. Mr. Stewart noted that he had been inspired touring the Spokane labs and hoped Dr. Cohen would find the time to visit. Committee members Biscontin and Schafrik then asked a series of questions about potential research collaborations across organizations to advance the work of the Division. Dr. Johns responded that the Division works well in partnership in exchanging ideas with various interested parties and would continue to use that model as appropriate. The Committee then thanked Dr. Johns and adjourned for lunch.

PMRD Directors Report

Dr. Stephen G. Sawyer, Jr.
Director for Pittsburgh Mining Research Division
National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention

Dr. Sawyer thanked the MSHRAC Committee for having him and thanked MSHA's Assistant Secretary Chris Williamson, MSHA's Director of Technical Support, Melanie Calhoun, and the MSHA ACC Center Chief, Juliette Hill, for hosting this MSHRAC meeting at ACC. Dr. Sawyer then thanked Todd Moore of Consol for the Enlow Fork mine tour held the day before.

Dr. Sawyer provided an overview for the presentation, which contained four main topics. These topics were listed as elongate mineral particle (EMP) research within PMRD, the current and future state of EMP research in PMRD, the Health Equity Mapper, and improvements to the Bruceton Experimental and Safety Research Mine. Dr. Sawyer then turned the presentation over to Dr. Steven Mischler to present historical and present EMP research being performed at PMRD.

Dr. Mischler began the presentation by defining key terms used in EMP research: asbestos, asbestiform, and elongate mineral particle. He explained that NIOSH started using the term EMP to include minerals that cause health effects but are not regulated, such as Libby amphiboles. Dr. Mischler then summarized the strategic goals and research objectives found in the NIOSH roadmap for research on asbestos fibers and other EMPs. He then discussed the major components of NIOSH research in this area, including to establish a common measurement and analytical protocol, with a special emphasis on dimensional analysis; to create a database of geologies

capable of producing EMPs when mined; and to create a repository of well-characterized reference material.

Dr. Mischler continued by describing the creation of the EMP laboratory at PMRD and listed the projects that have been completed since 2018. The initial project was to create the laboratory and the EMP team. The second project, beginning in 2019, was entitled “Understanding Elongate Mineral Particle Exposure in Mining,” and the third project, which is ongoing, is “Measurement and Analysis Tools for EMP Exposure in Mining.” Dr. Mischler continued the presentation by giving additional detail on each of these research projects, with a lengthy discussion on methods evaluated to separate EMPS into different size ranges for toxicological evaluations. He continued by summarizing research on the use of artificial intelligence for counting fibers to quantify exposure; evaluating the effects of milling on fiber characteristics and the resulting toxicological outcomes; and exploration into enhanced measurement and analysis techniques, including the use of Fourier-transform infrared spectroscopy (FTIR) with partial least squares-discriminant analysis to distinguish between asbestiform and non-asbestiform minerals. Dr. Mischler ended by describing work on using size-segregated samplers to only collect fibers known to cause health effects.

Dr. Sawyer resumed the presentation by thanking Dr. Mischler. Dr. Sawyer then again mentioned the NIOSH bulletin, “Asbestos Fibers and Other Elongated Mineral Particles: State of the Science and Roadmap for Research.” He discussed how PMRD ramped up efforts to help address the topics within the roadmap. Dr. Sawyer explained that Dr. Jessica Kogel, the Associate Director for Mining at the time, spearheaded this coordination as she possessed extensive expertise in this field. Several researchers were hired by PMRD to enhance EMP research within the Division, which produced many advancements in this area as was discussed by Dr. Mischler.

Dr. Sawyer then presented the six-year trend of the budget ceiling for PMRD, where it had fallen each year, and the fact that it currently sits at \$21.49 million. Dr. Sawyer followed those budgetary ceiling numbers with historic PMRD FTE levels over the last seven years. He mentioned that PMRD currently employs 113 individuals, which is down 46 people from fiscal year 2018.

Dr. Sawyer moved on to explain how EMP research is ever-evolving in complexity and how three researchers with EMP expertise had departed PMRD. Dr. Sawyer then explained that the difficult decision of pausing EMP research within the NIOSH Mining Program had to be made. He explained how a pause meant that if resources or opportunities arose to allow for EMP research to resume, then those considerations would be made and an unpauses could be executed.

Dr. Sawyer then explained that there was still some EMP research being performed within the institute outside of the NIOSH Mining Program. The NIOSH Health Effects Laboratory Division (HELD) had some project proposals in the works to build upon past research performed. Such past work by HELD included the development of new high sampling volume collectors that drastically simplified sample preparation and allowed direct electron and optical microscopy analysis. He mentioned how these new techniques can provide the sensitivity sufficient to address the new asbestos equivalent concentration limits (ECLs) from the EPA. Dr. Sawyer went on to mention some of the research HELD planned on performing contingent upon approval of the project. This possible research included several advanced fiber measurement and characterization methods, such

as the development of a flow imaging microscopy (FIM) method which could be an alternative to the current NIOSH Method 7400 direct-on-filter chemical imaging to allow for high physical and chemical specificity using optical photothermal infrared (O-PTIR) spectroscopy, correlative microscopy methods to combine multiple analytical microscopes for improved quantification of fibers, and artificial intelligence and machine learning algorithms to improve identification and classification of asbestos fibers.

Dr. Sawyer transitioned his presentation to discuss the Health Equity Mapper, which was created by a contractor under the direction of PMRD. The Health Equity Mapper is a graphical display that provides demographic information on areas around the country. Dr. Sawyer explained how the Health Equity Mapper was made to help the Division get a better understanding of the underrepresented or under-served populations they may touch through their work. Dr. Sawyer mentioned the limitations the NIOSH Mining Program Mine Data Survey had in capturing miner demographic information. He felt that this tool offered a look into the demographics of the surrounding communities where the mines PMRD collaborate with were located. Dr. Sawyer mentioned that the benefits offered to the miner in these communities had a ripple effect and the Health Equity Mapper would offer a glimpse of who may receive those secondary benefits. Dr. Sawyer demonstrated several examples displaying the functionality of the Health Equity Mapper and how simple it was in allowing the user to hand-pick various counties to graphically display the selected demographic data.

Dr. Sawyer entered the last phase of his presentation, which was discussing the modernization the Bruceton Experimental and Safety Research Coal Mine. He explained the increased utilization of the mine for research, training, and exhibits. Dr. Sawyer also discussed the efforts to modernize and automate the mine. Fiber optic cables have been hung throughout the mine terminating into network switches. Wi-Fi nodes have also been placed in strategic locations underground to create a wireless environment. Dr. Sawyer mentioned how creating this expansive network allows for the data collection on any experiment being executed in the mine to be seen from any device linked to the mines I/O. These improvements also allow for remote operation of the fan, water collection system, and water treatment.

Dr. Sawyer concluded his presentation and opened it up for any questions. Member Moore asked if the Bruceton Experimental and Safety Research Mine would be available for training of any of his company's mine rescue team members in the future. Dr. Sawyer explained that it is open for that possibility right now. Dr. Sawyer mentioned the benefits to PMRD in bringing outside industry members on site as it allows PMRD researchers to observe how the teams operate and exposes the company team members to NIOSH research.

Member Calhoun asked Dr. Sawyer about the research being performed on lithium-ion (Li-ion) batteries. Dr. Sawyer responded that NIOSH has several active projects looking at the safety and health aspects of those battery chemistries. In addition, Dr. Sawyer mentioned the memorandum of understanding (MOU) being crafted between MSHA and NIOSH to work on this exact area of concern and that collaboration should yield some very informative results.

Dr. Schafrik offered Dr. Sawyer thanks for having the virtual reality (VR) team travel to different universities in demonstrating that technology. He felt that was important exposure for the students

to have. Dr. Sawyer agreed and stated that the outreach and development of that product will continue.

Member Stewart asked if there could be some sort of closeout report concerning EMP research performed within the institute. Dr. Luxbacher interjected that NIOSH is not closing out EMP research but pausing it due to resource constraints. Dr. Sawyer agreed with Dr. Luxbacher's statement.

Member Moore asked if MSHA still had the explosion trailers they used to take around for demonstrations. Member Bowersox also remembered seeing that trailer with those demonstrations. Member Calhoun responded that MSHA still does have those trailers, but resource constraints have limited the travel allowed to put on those demonstrations.

Member Stewart circled back to the asbestos roadmap and commented that the effort put forth in its creation was not insignificant. Member Stewart engaged Dr. Mischler in a discussion concerning asbestos reference materials and asked if there was money set aside for these materials. Dr. Sawyer responded that it is difficult to discuss allocated funds because the shifting priorities dictate where those funds are spent. Dr. Sawyer mentioned how the portfolio of PMRD follows industry demand and internal capabilities to perform the work. Dr. Luxbacher had Dr. Sawyer display his budget ceiling slide again and explained why that number continues to drop, which results in having fewer employees, which forces tough decisions concerning research directions.

Chairman Zimmer thanked Dr. Sawyer for his presentation and moved to the next speaker.

Extramural Research Overview

Dr. George Luxbacher

Deputy Associate Director for Mining

National Institute for Occupational Safety and Health

Centers for Disease Control and Prevention

Dr. Luxbacher started the presentation by summarizing the four parts of the extramural program: (1) western mining and health safety grants, (2) underground mine evacuation technologies and human factors research, (3) robotics and intelligent mining technology, and (4) workplace safety research. He continued by giving more specifics on the grant number and topics. He then discussed the Broad Agency Announcement (BAA) and described a GE contract to create a 4-gas sensing unit. He mentioned that NIOSH BAA contracts often result in great concepts but that the manufacturer does not move forward because of the difficult approval processes discussed earlier. He mentioned that this year's BAA focus area was nonregulatory personal measurement of coal dust or silica, and that NIOSH received 42 proposals from 19 entities.

Dr. Luxbacher continued by presenting on the university health and safety research for the mining industry grants, formerly known as capacity build. He then discussed the work with Defense Advanced Research Project Agency (DARPA) on through-the-earth communications, how PMRD hosted the DARPA subterranean challenge, and how during this challenge NIOSH researchers met with NASA JPL personnel and how PMRD eventually signed an interagency agreement for advanced sensors and robotic deployment platform for increased safety and rapid response within

coal mines. Dr. Luxbacher continued that the result of this agreement was a working robot for mine rescue, which was then submitted to MSHA for approval and certification. Dr. Luxbacher concluded by outlining the options moving forward with this robot and asked for questions.

There was some discussion amongst the committee on additional drone work completed under NIOSH contracts. Member Schafrik commented that there are many mine rescue drones being developed but little training for mine rescue teams to incorporate these drones, and Dr. Luxbacher commented that there is one project that is evaluating how humans interact with drones in mine rescue situations. Ms. Hill asked about why GE was not interested in pursuing approval for its gas monitor, and Dr. Luxbacher answered that they did not believe the mining market was big enough. Member Stewart asked about the capacity build program and if it can be used by pulmonary physicians, and Dr. Luxbacher replied that this program is limited to mining engineering. He then passed the floor to Dr. Steve Schafrik.

Update on the NIOSH Underground Mine Safety and Health Research Laboratory near Mace, WV, Subcommittee Meeting

Dr. Steven Schafrik, Ph.D.

**Associate Professor, Mining Engineering
University of Kentucky**

Dr. Schafrik discussed the initial conclusions of the NIOSH Underground Mine Safety and Health Research Laboratory subgroup. The subgroup believes that MSHRAC's vision of the NIOSH Underground Mine Safety and Health Research Laboratory facility should be that of a unique world-class facility that can support internal and external research and host a variety of training activities. The group thinks that the facility should include surface and underground mine structures. The openings should simulate tunnels, coal room and pillar, stone room and pillar, longwall, and rock stopes. Dr. Luxbacher asked to be sure that longwall and shafts were included in the list. Somewhere in the facility there should be an area to simulate shafts. The underground layouts should be designed in a way to allow for future expansion. The subgroup created a variety of suggestions for the facility that closely align with the National Occupational Research Agenda. The subgroup believes that the facility should be working beyond just the previous facility's mandate of explosion prevention and study. The subgroup suggested that a public-facing facility be created to allow the local community and visitors to learn about the activities going on at the site.

Dr. Schafrik commented that he would like to complete a draft of the subgroup's recommendations by May 3, 2024, for review by the subcommittee and once reviewed have the DFO send to the MSHRAC members for review. Dr. Luxbacher emphasized the importance of this subgroup's report to enable Dr. Howard to push OSSAM for approval of a facility capable of supporting all of the necessary research areas.

Public Comment Period

Chair Zimmer gave the floor to Mark Plummer of Komatsu who had submitted his comments. Mr. Plummer explained that the advancements in Li-ion battery technologies have created improved

products, many that are applicable to the mining industry. He continued that Komatsu has designed a flame-proof enclosure which has received ATEX and IEC approvals for use in hazardous environments but there is no way to get these products into U.S. mines because MSHA has no standards for this technology. He then requested that NIOSH complete additional testing on this technology so that MSHA has the knowledge to create standards for regulations. Member Calhoun mentioned that NIOSH and MSHA are working on an MOU to find an avenue forward for Li-ion batteries. Dr. Sawyer added that NIOSH cannot just test one company's batteries and certify Li-ion batteries as being safe; instead NIOSH will take a holistic approach to explore general engineering considerations and methods to evaluate and mitigate safety concerns. He continued that the MOU is in place for this testing, but he cannot commit to a specific timeline for execution. Several committee members had questions about safety testing of the technology and international applications, and Dr. Luxbacher concluded the conversation by saying that MSHA and NIOSH need to consider how to move forward and what research needs to be completed. Chairman Zimmer asked for any other public comment with no replies.

Spring Meeting Planning

Dr. George Luxbacher
Deputy Associate Director for Mining
National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention

The Committee discussed the dates, location, and format for the next meeting. It was decided that potential dates would be circulated for input. The next meeting will include time for a report from the Mace subcommittee as well as a Mining Program update. The University of Kentucky in Lexington, Kentucky, was suggested for the site of that meeting with topics to include extramural and intramural research on silica and respirable coal dust.

Committee Discussion

At the conclusion of the planning for the fall meeting, the Committee discussed future presentations on critical mineral toxicity and health effects due to exposure of dusts from mining for critical minerals.

Adjourn

At the conclusion of the meeting, a motion was made to adjourn, was seconded, and was unanimously approved.

Appendix A – Attendees

NAME	AFFILIATION
Davood Bahrami	NIOSH-PMRD
Denise Baker	NIOSH-PMRD
Timothy Beck	NIOSH-PMRD
Kristina Behringer M.D.	Cheyenne Physician Group - Committee Member
Pauline Benjamin	NIOSH-OD
Sekhar Bhattacharyya	Penn State University
Giovanna Biscontin	NSF - Ex Officio
David Blackley	NIOSH-RHD
Ronald Bowersox	UMWA - Committee Member
Kathy Braunegg	NIOSH-PMRD
Andrea Brickey	South Dakota School Mines & Tech - Committee Member
Kendra Broadwater	NIOSH-SMRD
Melanie Calhoun	MSHA - Ex Officio
Danielle Carlin	NIEHS, NIH - Ex Officio
Jacob Carr	NIOSH-PMRD
Linda Chasko	NIOSH-PMRD
Eric Chatfield	EJ Chatfield
John Cowie	Essential Minerals
Denise Coyle	MSHA
Jerry Davis	Komatsu
Cory DeGennaro	NIOSH-PMRD
Thomas Dubaniewicz	NIOSH-PMRD
Tom Duffy	USW - Committee Member
Zoe Dugdale	NIOSH-SMRD
Mark Ellis	IMA-NA - Retired
Yousef Elmashae	NIOSH-PMRD
George Gardner	MSHA
Dr. Noemi Hall	NIOSH-RHD
Cara Halldin	NIOSH-SMRD
Cassandra Hoebbel	NIOSH-PMRD
John Howard	NIOSH-OD
Michele Inks	NIOSH-PMRD-OD
Marilyn James	NIOSH-OD
Doug Johns	NIOSH-SMRD
Hua Jiang	NIOSH-PMRD
Lydia Kocher	NIOSH-PMRD
Carin Kosmoski	NIOSH-PMRD-OD
Dr. Scott Laney	NIOSH-RHD
George Luxbacher	NIOSH-OD Mining
Launa Mallett	NIOSH-PMRD
Robin Markussen	Heidelberg Materials
M. Bernardine Metzger	NIOSH-OD Mining
Benjamin Miller	Colorado School of Mines
Courtney Miller	CSE Corporation

NAME	AFFILIATION
Hugh Miller	Colorado School of Mines
Steve Mischler	NIOSH-PMRD - DFO
Erin Moore	IMI Fabi, LLC
J. Todd Moore	Consol Energy - Committee Member
Michael Murphy	NIOSH-PMRD
Mahiyar Nasarwanji	NIOSH-PMRD
Carol Nixon	NIOSH-SMRD
Gerald Poplin	NIOSH-SMRD
Elizabeth (Libby) Pritchard	NSSGA - Committee Member
Vaibhav Raj	NIOSH-PMRD
Robert Randolph	NIOSH-OD Mining
Miguel Reyes	NIOSH-PMRD
Steven Sawyer	NIOSH-PMRD-OD
Steven Schafrik	University of Kentucky - Committee Member
Joseph Seymour	NIOSH-SMRD
Brent Slaker	NIOSH-PMRD
Kent Slakey	NIOSH-OD
Dave Snyder	NIOSH-OD Mining
Matthew Stewart	R.T. Vanderbilt - Committee Member
Aaron Sussell	NIOSH-SMRD
Nirmala Thomas Myers	NIOSH-RHD
Lewis Underwood	NIOSH-OD
David Weissman	NIOSH-RHD
Christopher Williamson	MSHA
Dana Willmer	NIOSH-PMRD
Samantha Wilson	NIOSH-SMRD
Allegra Yeley	NIOSH-SMRD
Liming Yuan	NIOSH-PMRD
Chenming Zhou	NIOSH-PMRD
Kyle Zimmer, Jr.	IUOE - Committee Member (Chair)

I hereby certify that, to the best of my knowledge, the minutes of the April 17, 2024 meeting of the Mine Safety and Health Research Advisory Committee (MSHRAC) are accurate and complete.

Chair, Mine Safety and Health Research
Advisory Committee