

RESPONSE TO THE NATIONAL ACADEMIES REPORT ON THE NIOSH MINING PROGRAM

BACKGROUND

NIOSH contracted with the National Academies to conduct an evaluation of its research programs, including the Mining Program. Specifically, the Academy was tasked to evaluate the relevance and impact of the Program, and to assign a numerical score to represent its assessment. Additionally, the Academy was tasked to examine future issues and provide recommendations on areas for consideration of future research.

The Mining Program prepared an "evidence package" to document its activities and impact over the past ten years. However, because the Mining Program was the first NIOSH research program to be reviewed, this package was prepared without guidance from the Academy's Steering Committee, and as such is structured somewhat differently from subsequent packages prepared by NIOSH. The evidence package is organized into four sections corresponding to the following four questions about the Mining Program:

- What is it?
- What does it do?
- What has it accomplished?
- What will it accomplish?

Both printed and electronic copies were provided to the Academy. The printed version is 950 pages and is available for inspection at the Bruce Research Center, while the electronic version can be viewed at <http://www.cdc.gov/niosh/nas/mining/>.

The evidence package was prepared during the period of May through December 2005. Leadership from the Mining Program met with the Academy's committee on January 11, 2006, and presented an overview of the Program. During its deliberations, the committee submitted questions in writing to NIOSH, and Mining Program staff provided written answers. After completing its review, the Academy presented its findings to NIOSH on April 27, 2007. Mining Program staff studied the Academy's draft report and began to implement an action plan during the period of May through July 2007. The plan was to finalize this response in August 2007. However, the Crandall Canyon Mine disaster and subsequent activities required significant resources from Mining Program staff, delaying completion of the formal response until December 2007. Nevertheless, the implementation of some recommendations has been, or is in the process of being, completed as detailed below.

This report and the NAS report, were distributed to NIOSH's federal advisory committee, the Mine Safety and Health Research Advisory Committee (MSHRAC) in December 2007, for its review. The proposed responses were then presented and discussed in detail with MSHRAC at the meeting on January 23, 2008. MSHRAC completely endorsed NIOSH's response to each of the recommendations, as reflected in this report.

PURPOSE

The purpose of this report is to summarize the actions that are planned or that have already been undertaken in response to the committee's recommendations. In some cases, additional information is provided, as needed, to offer insight into the reasons why certain actions are or are not being taken.

SUMMARY

The NIOSH Mining Program was evaluated by a technical committee organized by the National Academies of Science and Engineering. The process for this review was defined by a framework committee. The findings and recommendations of the committee are documented in its report entitled, "Mine Safety and Health Research at NIOSH."

The committee assessed the relevance and impact of the Mining Program, concluding the following:

" . . .research of the Mining Program is in high-priority areas and adequately connected to improvements in the workplace. A rating of 4 on a five-point scale (where 5 is the highest) is appropriate. Contributions of the program to improvements in workplace health and safety during the period evaluated (1997 to 2005) are considered major in some areas (respirable disease prevention, traumatic injury prevention), moderate in some areas (hearing loss prevention, ground failure prevention), and likely in a number of areas (disaster prevention, musculoskeletal injury prevention). Mining Program outputs are evaluated, accepted, and incorporated into stakeholder operations, and training outputs find wide use in the industry. The Mining Program is moderately engaged in technology transfer activities. A score of 4 for impact is appropriate."

The report recognizes the many accomplishments of the NIOSH Mining Program over the past eight years. These scores of 4/5 for relevance and 4/5 for impact reflect that taxpayer resources are being focused in high-priority areas, and that over the past ten years the results of the NIOSH mining research have had significant impact on improving the health and safety of miners. The Academy's assessment is particularly gratifying to the researchers at the Pittsburgh and Spokane Research Laboratories, who have worked to build a customer-focused and high-quality program within NIOSH. Notwithstanding, the report provides important insights into opportunities to further improve the relevance and impact of the Mining Program.

We believe it is appropriate to publicly acknowledge the effort and dedication of the experts who served as volunteers on the National Academies committee. They spent countless hours reviewing and analyzing thousands of pages of documentation, attending meetings, and touring laboratory facilities. Their insights, provided in the report and through oral debriefings, have been most instructive. We appreciate their contributions,

and we are anxious to apply their recommendations to improve the effectiveness of the Mining Program.

REPORT FORMAT

The Academy's evaluation was presented in two parts. Part I was a programmatic evaluation, with Chapter 7 detailing the overarching recommendations. This report addresses the NIOSH Mining Program actions with regard to each of those recommendations.

Part II of the Academy's report focused on evaluations of individual projects that were in the NIOSH research portfolio at the time our materials were submitted to the committee. Those comments were reviewed by the research staff, and appropriate changes were made to those projects.

MAJOR OVERARCHING RECOMMENDATIONS

STRATEGIC GOALS AND PROJECT SELECTION

1a. Establish more challenging, innovative goals and attendant objectives. Take a more proactive approach to identifying and controlling hazards.

The Strategic Research Plan for the Mining Program, including intermediate and annual goals with performance measures, was completed in 2004. Each strategic goal represents a mining safety or health outcome, e.g. “eliminate coal worker pneumoconiosis.” The decision to focus top-level goals on the elimination of occupational illnesses, injuries, and fatalities was based on guidance from the Office of Management and Budget, which stresses the need to focus on outcomes, and on the belief that both the research and the researchers need to focus on the impact of their work and not on specific research products. While the successful development of an instrument or the publication of a paper may be an important intermediate step, few direct benefits accrue to mine workers until those research products are translated into practice. The choice of strategic goals with performance measures tied directly to health and safety outcomes underscores this important point. Admittedly, achievement of the goals will depend upon the actions of others, e.g. mine operators or regulators, in addition to NIOSH personnel; nonetheless, we need to concern ourselves with the successful translation of our research products into the workplace, and the establishment of performance targets that are coupled to safety or health outcomes that issue.

Each strategic goal is populated with intermediate goals, which represent essential steps or building blocks to achieve the strategic goal. In most cases, these are three- to five-year goals, and there may be multiple projects involving research and other activities that will lead to accomplishment of the intermediate goals. Generally these intermediate goals represent important knowledge or technology gaps or barriers. Performance measures are used to track progress.

The existing Strategic Research Plan was reviewed and endorsed by MSHRAC, and reviewed and approved by OMB. The plan has been reviewed annually, and was scheduled for a major update once the results of the Academy review became available.

Action: The strategic plan is undergoing a major review and will be revisited by the end of FY08. As part of this effort we will look for opportunities to make goals more aggressive or challenging. The mine disasters of 2006 and 2007, the MINER Act, and other legislative actions have significantly changed priorities within the current NIOSH Mining Program, and these priorities will be reflected in the new plan. Finally, we have been taking steps to better leverage and coordinate the assets at the Pittsburgh and Spokane Labs, and the revised strategic plan will reflect those efforts as well.

1b. Take a more proactive approach to identifying and controlling hazards.

Currently we utilize the available surveillance databases in conjunction with stakeholder input to identify many key needs and to set priorities within our research program. Although it was not documented in the evidence package reviewed by the committee, we do employ a variety of other methods to identify emerging hazards and other problem areas that may not have yet shown up in the surveillance data or on the “issues” lists of our labor, industry, and government stakeholders. For instance, NIOSH Health Hazard Evaluations and in-mine observations by our many field teams provide vital input. Much of the original mining noise control research was initiated after NIOSH completed analyses of hearing loss databases, leading us to conduct a cross-sectional survey of noise exposure to guide our intervention efforts. Examples from current projects include black lung “hot spots,” hydrogen sulfide gas emissions, electrical grounding practices, and guidelines to design safer roof spans and pillars in underground stone mines.

We agree with the importance of taking a proactive stance towards identifying and controlling hazards, and not waiting for the stakeholders to first bring the problem to us, nor waiting until fatalities, injuries, or illnesses develop.

Action: We will continue employing a proactive approach, and will seek other sentinels and means for identifying unrecognized or emerging hazards in the mining workplace.

INTERACTION EFFECTIVENESS

2. Increase interaction with other NIOSH programs.

The Academy’s committee felt that the Mining Program could benefit from more use of the expertise possessed by other NIOSH divisions, especially in the medical, industrial hygiene, and surveillance areas. Conversely, it was further believed that the problem-solving focus of the Mining Program could be of benefit to the other NIOSH divisions. The committee also recommended that the Mining Program challenge its federal advisory committee, MSHRAC, with more substantial assignments, and that MSHRAC findings, conclusions, and recommendations be considered more fully.

We agree with this recommendation, and we intend to continue and expand greater collaboration among NIOSH divisions. An example of close collaboration with the Division of Respiratory Disease Studies (DRDS) is the current PRL project on black lung “hot spots.” We also work closely with two other NIOSH divisions, DSHEFS and DART, in the hearing loss prevention research area. The new NORA II matrix management structure (e.g., cross-sector programs in respiratory diseases, hearing loss prevention, traumatic injuries, etc.) within NIOSH is expected to enhance collaboration across NIOSH divisions. The Mining Program has representatives on all of these cross-sector program steering committees.

Engineers and scientists at the mining laboratories are sought by the other divisions to work on a variety of projects, and past collaborations have been highly valuable in the past. Mining researchers have made important contributions to solving problems in the agriculture and construction sectors, for example. However, in recent years the decline in the number of mining researchers has made it difficult to adequately staff projects critical to mine worker safety and health, making it difficult to contribute staff to work in other sectors. This has become especially critical in the past 18 months with the increasing number of retirements, the difficulty of recruiting new staff, and the dramatic increase in workload following the mine disasters in 2006 and the MINER Act.

Historically, we have not given substantial outside assignments to MSHRAC for two reasons. First, over the years, this committee has been comprised of senior and accomplished personnel from labor, industry and academia, and they have had limited time to devote to MSHRAC outside of the full meetings and the preparation for those meetings. Second, many MSHRAC committee members are active in other NIOSH-related activities, such as the research partnerships, and through those forums provide valuable insights. It would be incorrect, however, to undervalue the significance of the committee's contributions. For example, MSHRAC reviewed and provided input on the Mining Program's strategic plan with its performance measures. This plan has effectively guided the program for the past four years. Another example is MSHRAC's review of individual program areas, such as disaster prevention and response, hearing loss prevention, and respiratory hazards. In all cases, the advisory committee's findings and recommendations have been fully considered and routinely accepted into the planning process. Nevertheless, we have not satisfactorily documented the extent of the work done by MSHRAC nor detailed exactly how we have utilized the committee's work.

Actions: We will seek the assistance of other NIOSH divisions wherever it is needed to address mining problems, especially the industrial hygiene and medical surveillance expertise found in other divisions of NIOSH. We will attempt to accommodate requests from other divisions to utilize the engineering and physical sciences expertise of the mining labs, but only to the extent that it will not compromise work on current and new mining safety and health projects.

We will strive to make more use of the Mine Safety and Health Research Advisory Committee and to schedule at least one face-to-face meeting every 9 to 12 months. We will improve the documentation of the committee's assignments and the results of those assignments so that MSHRAC's work and its impact are more transparent. At the next meeting of MSHRAC, for example, the committee will be charged with three significant assignments: to review the draft report of our response to the NAS review; to review our past efforts on coal bump research and offer guidance on future work; and to review and provide general guidance related to other parts of the Mining Program.

3. Enhance interaction with the Mine Safety and Health Administration (MSHA) where research needs are closely aligned with MSHA’s legislative and shorter-term priorities.

The Academy committee recognized in its report the “high level of cooperation between the Mining Program and MSHA” and stated that this partnership is essential for advancements in miner health and safety.

NIOSH and MSHA have a long-standing history of successful collaboration. In some areas, such as ground control, explosions, training, and electrical safety, the interactions have been extensive, harmonious, and productive. In a few areas there has been less agreement and more conflict, and these tend to directly involve health rather than safety issues. Notably, these cases have occurred when MSHA introduced a rule and ongoing NIOSH research appeared to be at cross purposes with MSHA’s rule. In recent years, this was most apparent with our research on the development of controls for noise and diesel particulate matter. There will always be the potential for conflict as NIOSH pursues its mission of preventing occupational injuries and illnesses through research and MSHA pursues its mission of regulating the industry. As we well recognize, both agencies contribute to the overall improvement in mine worker safety and health, and miners will be best served through the coordinated efforts of both. Toward this end, we enthusiastically support the Government Accountability Office’s (GAO) recommendation that a Memorandum of Understanding (MOU) be utilized to clarify the working relationship between the two agencies. We believe this would also address the intent of the Academy’s recommendation.

Action: HHS has sent a letter to GAO stating the intention of establishing a Memorandum of Understanding (MOU) for the purpose of clarifying the working relationship between NIOSH and MSHA. Discussions between NIOSH and MSHA on this MOU were initiated in May 2007 and progress on the substance of an MOU has been made. However, the Crandall Canyon Mine disaster, associated legislative activities, and other related priorities have shifted the attention of senior staff in both agencies to more urgent matters. Nonetheless, our goal is to complete the MOU by the end of this fiscal year.

We will encourage MSHA to share a longer term view of its priorities for future regulations to allow adequate time for the completion of research that could better inform their regulatory development process.

The Academy committee did not specifically recommend that we increase our interactions with other federal agencies, but we believe that is becoming more important as well. Therefore, we will strengthen our collaborations with other federal agencies (e.g., NASA, Defense, Energy, and Homeland Security) through the Interagency Working Group, which was established under the MINER Act. This working group held its first meeting in Pittsburgh in July 2007. NIOSH managers and staff have also visited agencies represented on the working group to enhance interagency communication and collaboration on mining safety and health problems.

4. Fully utilize outside technical expertise through a vibrant extramural and contract research program.

We agree completely with this recommendation. Historically, the funds available for extramural mining activities have been limited, and as a result there have been few opportunities for innovative research contributions from universities and other non-government research organizations. Moreover, the paucity of extramural research funds has resulted in a serious decline of trained professionals coming out of graduate programs at the mining universities. Congress recognized in the MINER Act of 2006 the need to invest in new research, and it created a new contracts and grants program in NIOSH's Office of Mine Safety and Health to facilitate the development and testing of innovative technologies to improve mine safety and health. Although the Act authorized the appropriation of funds to carry out this and other mandates, such funds have yet to be appropriated.

Action: NIOSH has greatly expanded its investment in extramural research using the funds received under the Emergency Supplemental Appropriation Act of 2006 (ESA). Contracts have been awarded under the ESA for improved communications and tracking systems for mine emergencies, refuge chambers, and for improved self-contained self-rescuers. NIOSH issued a broad agency announcement in March 2007 requesting proposals for new research technologies in communications systems, miner escape and rescue strategies, methane monitoring, mine seals, and other areas of mine safety. Currently, approximately \$8 million is being used to fund research at universities, government labs, and private labs.

Recently, NIOSH successfully established the safety technologies contracts and grants program, as mandated by the Act, and we are awaiting an appropriation to launch it. It appears that the FY08 budget will include additional base funding for this critical program. If so, we will begin soliciting proposals immediately and will continue this contracts and grants program indefinitely. Once implemented, this new mining contracts and grants program should create the more vibrant extramural component envisioned by the committee.

5. Partner more broadly such that guidelines and processes are most relevant to the entire mining community.

The Academy committee acknowledged the extensive list of partners from labor, industry, and academia that partner with NIOSH on mining research, but expressed concern that solutions may be site-specific and not more broadly applicable. The committee expressed a strong belief that the Mining Program should continue to develop international partnerships to facilitate the transfer of NIOSH development and to gain access to innovations developed in other countries.

We share the committee's view that solutions must be applicable to the mining industry at large. Many of our projects follow a time-tested pattern of studying the problems at mine sites, conducting lab and computer studies to understand the problem and develop potential solutions, developing interventions and testing them in the lab, and then introducing them into one or more mines for additional study. Deliberate steps are taken to ensure that the interventions will be applicable to the larger population of mines that are experiencing the problem. Usually, industry and labor partners within the partnerships contribute significantly to the selection of sites to ensure utility and translation to the largest number of mines. We continue to believe that the labor unions (UMWA, USWA, IUOE) and the trade associations (NMA, BCOA, NSSGA, IMA-NA) represent the single strongest resource to help maintain focus on the more important problems, while simultaneously ensuring that the execution of the work will be useful to the greatest number of mines or miners.

Notwithstanding the above procedures, it is possible that a few projects may be narrowly focused, perhaps unnecessarily so, and these may produce results of limited application. A related concern is that in-mine studies should fundamentally address problems of a research nature. There is a continual risk that researchers will be invited to a mine to examine a mine-specific problem and to propose a solution. In some cases, the solutions are well-known and the problem could be solved by private consultation. We work diligently to ensure that our activities are not simply technical assistance or consultations, and that project work is focusing on identified gap areas. Absent any specific examples from the committee, we are unable to take any targeted actions, but we will redouble our internal efforts to address this concern.

We share the committee's belief that international collaborations need to continue to grow. Over the past decade, budget limitations and administrative policies discouraging international travel have severely limited the level of international collaborations possible in the Mining Program. Despite the difficulties, we have entered into formal collaborations with South Africa, Canada, Australia, Germany, Poland, England, India, New Zealand, Japan, and China, through the Global Mining Research Alliance, The International Committee on Coal Research, and The Safety in Mines Research Institutes. After the Sago Mine disaster in January 2006, we significantly and actively increased our research collaborations with many of these countries.

Action: We share the concern that some work at individual mine sites may not be able to be generalized to the industry-at-large, but absent any specific examples from the committee, we are at a disadvantage. Nonetheless, we will establish a process and review the in-mine tasks of current projects to assess their relevance to the mining community, taking whatever actions may be appropriate. We will continue to emphasize this issue in our training of project managers and principal investigators. We will continue to rely heavily on our traditional labor and industry partners to help ensure that our work will serve the industry-at-large and not only a few mines.

OUTPUTS

6. Place greater emphasis on outputs preferred by mining operators, miners, and other non-technical users.

The Academy committee recommended that the Mining Program study the means by which its stakeholders obtain information and make decisions. Our outputs are heavily weighted towards products that will allow for direct application to the intended audience. Three typical examples of how research results are packaged and delivered to facilitate translation include a “how to” video and guide for mechanics to reduce dust infiltration in operator cabs, a computer-based tool to help mining engineers select the best roof support for a given application, and a two-day workshop conducted in the mining district to help mechanics reduce diesel emissions. We receive extensive feedback from every level of the industry on the value of our various products or outputs. Admittedly, much of our knowledge of the preferred format of outputs and its value to our customers is anecdotal, and we do not disagree with the recommendation to study the means by which our stakeholders obtain information and make decisions.

Action: NIOSH has issued a request for proposals for independent studies to “Develop Effective Technology Transfer and Communications Strategies of Research Results to Occupational Health and Safety Communities of Mining and Non-Mining Communities to be used in the Workplace.” We will use this procurement and other appropriate means to increase our communication about outputs in clear language to all parts of the mining community.

SURVEILLANCE AND MONITORING

7. Make better use of MSHA and other existing surveillance data and work to make these surveillance programs more robust.

MSHA’s surveillance data are the most comprehensive of any industry, and the analysis of these data provides remarkable insights into answering the questions of “where? how? and to whom?” We supplement the MSHA database with data obtained from other NIOSH divisions and federal agencies, such as the Bureau of Labor Statistics. In total, this process has provided excellent guidance for establishing priority areas within the Mining Program. One notable gap is with the so-called denominator data, and we began conducting a large demographics survey three years ago to address this gap. Because of the time and effort to complete such a survey, it is only practical every decade or so. Nevertheless, we are intrigued by the suggestion of teasing additional insights from the existing MSHA database and are evaluating approaches for doing so.

Action: We will fund one or more studies on approaches that will make the surveillance program more robust. We will consider the need to update the demographics data on a more regular basis than was done in the past, although an annual update is probably not feasible.

8. Develop more robust and better methods of monitoring in situ safety conditions in mines.

The NIOSH research mission emphasizes occupational rather than environmental safety hazards. Therefore, some research activities, such as the suggested subsidence monitoring and the assessment of potential for damage to surface structures, were discontinued after the closure of the Bureau of Mines as being beyond the scope of the NIOSH mission. The NIOSH Mining Program continues to seek improved technology to monitor occupational safety hazards at mines in addition to occupational health hazards.

Action: The Mining Program will continue research on monitoring of in situ safety conditions for surface and underground mines. It is likely that we will expand work in this area under the mandate of the MINER Act to increase efforts in the area of safety technologies.

TECHNOLOGY TRANSFER AND TRAINING PROGRAMS

9. Develop a more proactive, aggressive, and strategic dissemination agenda that is informed by research about the diffusion of new technologies, processes, and practices. Determine the likely end users of its products.

This recommendation is certainly a fundamental guiding principle for the successful translation of research into practice. We understand that the Academy committee had no specific issues with the Mining Program's aggressive strategies for disseminating its products or with its identification of the users of its products. However, there was some concern because we have done few formal studies of the effectiveness of our products.

We agree that it is important that the end users be identified and their needs be well understood, and we believe we have achieved both goals. We recognize the value of conducting more formal intervention effectiveness studies, and we agree that it is imperative to take steps to ensure that our research products are actually being translated into practice, which results in improving safety and health outcomes. This approach is consistent with NIOSH Director Dr. John Howard's Research-to-Practice (r2p) initiative throughout the Institute, designed to place greater emphasis on putting our research results into actual use in the workplace. Despite the cost of conducting formal intervention effectiveness studies, we agree with the need to do so on a selective basis.

Action: We will increase our efforts to be informed on the latest research findings for improving the translation of research projects into practice, and we will apply this knowledge to the Mining Program's r2p activities.

Further, the committee made its concerns regarding the lack of formal intervention effectiveness studies known to NIOSH nearly a year before its draft final report was

issued. As a result, we began to address this issue nearly 18 months ago. Activities that were initiated or are planned include:

- We funded a study to assess the diffusion of the NIOSH Mining Program interventions into the mining practices of the nation's coal mines. This will include a survey to evaluate the application of the developed interventions in working coal mines. This survey will collect information about the number and characteristics of coal mines that have adopted the NIOSH recommended practices in the areas of the control of dust, explosions, and falls of ground, as well as mine emergency preparedness and training. The survey will gather data about the barriers to adopting these practices and how some mining operations have been able to implement the interventions in spite of the barriers.
- We initiated a project in 2006 entitled, "Developing an Information Dissemination Model for PRL Research Translation Efforts." This project will develop an information dissemination model based on an evaluation of current PRL communication dissemination efforts.
- A contract was awarded three months ago to enhance technology transfer from the Mining Program (this was mentioned previously under recommendation 6).
- We will initiate a study, through an external contract, to evaluate the effectiveness of our training products.

10. Develop demonstration projects that show the feasibility and effectiveness of interventions.

We have found that in-mine demonstration of the practicality and utility of our research products is a prerequisite to their successful transfer to practice. A demonstration component is built into virtually every project that includes an intervention as an output. Moreover, a few projects are specifically structured as demonstration rather than research projects. However, large field demonstrations of new technology can be very expensive, and therefore we must usually limit the number of demonstration sites or times. Generally we rely heavily on our industry and labor partners to help in the selection of demonstration sites for maximum efficacy.

Action: Demonstrations of the effectiveness of new technologies in operating mines will continue to be a significant activity within the Mining Program.

11. Include how small business worker populations will be served.

To reach this population, the Academy committee suggested that NIOSH work with MSHA's Technical Assistance Program. For practical reasons, it is especially difficult to communicate research results to small mines. A series of seminars "Improving Safety at Small Underground Mines" was given in the mid '90s at locations near small underground mines in Appalachia. We believe that it would be timely to do a similar

series of seminars again to provide small mines with updated information on safety technology.

We understand that we have not been effective in specifically targeting small mines in our research, hoping that our new technologies will be broadly applied throughout the industry. We recognize that small mine operators, especially as smaller mines, often have higher accident rates and fewer resources to address health and safety problems.

Action: The Mining Program is revising its strategic plan and this area has been identified as one of the challenges to be addressed. An action plan for this area will be developed separately and will include discussions with MSHA's Technical Assistance Program to identify small mines that have special safety and health problems and needs.

12. Incorporate training into the strategic goals of all research areas.

Training is a tool or intervention designed to achieve or facilitate outcomes, as is the use of computer modeling or engineering analysis, for example. Nearly six years ago the leadership of the Pittsburgh Research Laboratory recognized the value of incorporating training into each of the programmatic areas, and training experts were transferred into each of the strategic goal areas. Their work was then integrated into the projects within that strategic area. For example, training experts in the Hearing Loss Prevention Branch worked on projects with noise control researchers to reduce noise-induced hearing loss in mines by addressing both the underlying behavioral as well as engineering issues. That approach has worked well over the past four years and could also be applied to the projects at the Spokane Research Laboratory.

Research to improve training effectiveness is also important, and we have a small group of researchers investigating those issues from a mining perspective. The development of effective training programs for the evolving workforce in mining presents specialized research problems, which are being addressed through research conducted within the Mining Program. The results of this work can now be applied during the development of training modules for a range of mining safety and health programs, and this knowledge can be applied by NIOSH as well as others.

Action: The original strategic plan discussed training as a cross-cutting goal at only one location in the document, to reflect the research component. We will ensure that the revised strategic plan clearly presents our current practice of using training as a tool under each strategic goal; this practice will be fully integrated at the Spokane Research Laboratory by the end of FY08

EMERGING ISSUES

The Evaluation Committee was asked to identify significant emerging health and safety issues in the mining workplace. The following five recommendations reflect the committee's deliberations on this important task.

13. Stay aware of pertinent current and emerging research, including international research, and be prepared to act on potential health and safety issues.

The committee recommended that the Mining Program seek external input to determine future research areas. We agree with this recommendation and will continue to solicit input from our customers and stakeholders on this and other issues. We maintain ongoing activities aimed at strengthening the international component of the Mining Program. Over the past 18 months, several NIOSH managers and scientists have traveled abroad to meet with labor, industry, and government mining experts to improve our firsthand knowledge of their safety and health problems and solutions. We have initiated technology transfer by hosting international experts here in the U.S. and by sponsoring workshops on contemporary topics. For example, we hosted a workshop on gob monitoring and seal practices in Australia, and had two experts from Australia's research organization, SIMTARS, present lectures and answer questions on their practices. We expect to be working more closely with SIMTARS (and many other international agencies) in the future.

Our participation in the Global Mining Research Alliance (GMRA), with research organizations in Australia, Canada, and South Africa, will help ensure that NIOSH scientists are aware of the latest research being done in other countries with advanced mining industries. Within the availability of funds we attempt to send our scientists to domestic and international conferences where they can exchange research findings with their scientific peers. We also prepare detailed written proposals for all new projects, and have the proposals peer-reviewed by external scientists and stakeholders before any significant expenditure of funds on the projects. External reviewers of our new research proposals include experts from industry, organized labor, MSHA, academia, and international research organizations.

Action: In addition to our efforts to seek external input to determine future research areas, we will continue to monitor international progress on mining safety and health problems, and to take steps to improve our international awareness and activities. Finally, we will seek the advice of MSHRAC on emerging safety and health issues and the need for new research areas.

14. Be prepared to deal with issues associated with increased remote control and automated equipment and systems.

The Bureau of Mines had a research program specific to health and safety aspects of remote control and automation. This program was eliminated with the transfer of mining

research to NIOSH because of the high cost of the program and the perception that automation could lead to the loss of jobs in mining.

The introduction of remote-controlled or automated equipment can introduce new hazard. The remote operation of continuous mining machines is state-of-the art technology widely used in the industry, for example. However, this new technology introduced unanticipated hazards when the remote miner operator positioned himself under bad roof or when he was pinned by the machine he controlled (i.e., within the red zone). In response, in partnership with industry and other stakeholders, NIOSH developed a proximity warning system to better protect the operator. We have also investigated the safety-related issues of automated systems and produced a series of publications that provide detailed recommendations to ensure the safety of these automated systems.

The increased use of automated and remote controlled equipment may be a viable approach to reduce the exposure of mine workers to various safety and health hazards. In Australia, for example, remote controlled LHDs are used to remove mine workers from the noise, dust, diesel particulate matter, and other hazards associated with the manual operation of that equipment in underground metal mines. Improved automation of the longwall face may be an effective means of further reducing mine worker dust exposures in underground coal mines.

Action: We will maintain awareness of trends toward the use of remote control and automation in mining and focus on the impacts of technology on miner safety and health. We will work on any interventions that may be needed to control new hazards that may be introduced, but we do not plan to develop any new automation or remote control technology as part of the NIOSH Mining Program.

15. The mining program should be prepared to provide recommendations to safeguard health and safety as best strategies for mining deep resources are developed. Environmental and occupational hazards of deeper mines should be evaluated.

The Mining Program has initiated several projects that are focused on following the changing trends in mining, including mining deeper and more challenging resources. The recent disaster at the Crandall Canyon Mine has focused specific attention on the problems of coal bumps in deep coal mines, but this is only one example of possible problems as mining activities in coal and metal/nonmetal mining exploit deposits that present more adverse conditions than typically encountered in the past (e.g., heat and gas).

Action: A joint project has been planned to examine research issues associated with mining at greater depths. A full proposal has undergone peer review, and the planned project will be presented to MSHRAC for comment. Other related needs will be considered in the strategic planning process.

16. Address the health effects of mixed exposures, such as diesel exhaust, hydrocarbons, and noise, as well as the combined effects of mixed noise (continuous and impulse-impact) environments.

We believe this is an interesting and potentially important line of research. Work at the PRL and SRL does not normally include health effects research, but we will bring this topic to the attention of the NIOSH divisions that have conducted mixed exposure research in the past. It should be noted that mixed exposures to combinations of chemical or physical agents was one of the 21 priority research areas identified in the original NORA program in 1996. It has been found to be extremely difficult to quantify the effects of most mixed exposures. Accurate determinations of the risk even from single agents can be very difficult, and that difficulty is greatly magnified when combined effects of multiple agents are being studied.

Action: We will alert other NIOSH divisions to the concern for mixed exposures in mining.

17. Consider the extent and effects of radon and radiation exposure in the presence of other potential chemical agents as the United States increases its reliance on nuclear energy.

We agree that there is a renewal underway of the uranium mining industry in the U.S. To that end, we initiated a small internal study entitled "Evaluation of Mining Databases and Literature for Exposures of Miners to Radon," which was completed earlier this year. We will ensure that health aspects of radon exposure to future miners will be examined.

Action: We will be alert for plans made by industry to renew uranium mining in the U.S, and we will evaluate the risks to mine workers. We will offer workshops or employ other health communications strategies to inform this re-emerging industry of the radiation health hazards and the technology needed to control the hazards. The longer term need for research in this area is currently under study, and will be considered during the upcoming process of revising the strategic plan.

18. The Mining Program should seriously attend to workforce replacement issues expected within its own organization in the short term to ensure a supply of capable researchers as its older researchers retire.

We strongly agree with the recommendation. The issue of workforce replacement is a very high priority for the future of the NIOSH Mining Program, and at this time we have lost key senior staff, typically through retirements, in most of the strategic areas. The losses are so critical that we have terminated work in some areas, e.g. explosives, and are reducing activities in others, e.g. fires, for lack of staff. We have been attempting to recruit in key positions for more than three years, with minimal success. The global

surge in mining, including here in the U.S., has created an unprecedented demand and competition for mining professionals. We have lost staff to the industry and we have had recruits decline our offers in favor of industry positions. Moreover, the elapsed time between our decision to hire and the official government offer routinely exceeds four months and can be even longer. Thus, we have lost candidates who simply are unable or unwilling to be “in process” for that length of time.

A year ago we embarked on a major international recruitment drive and have advertised in major mining publications in the U.S. and abroad. We are currently recruiting 35 scientists and engineer to join the NIOSH mining research staff. Candidates in all mining-applicable disciplines are being sought, including chemistry, physics, and many fields of engineering. We also have been able to obtain the part-time services of a few of our recently retired former employees, who have provided their expertise on some critical issues.

Action: We will continue to recruit aggressively. However, the global demand for mining professionals, combined with declining number of graduates from the mining universities, have resulted in a serious shortage of professionals with the credentials and interest to work in a government research organization. Further, traditional government hiring policies limit our ability to hire quickly and at competitive salaries. In the current climate of keen global competition for mining professionals, these have made it even more difficult to recruit the highly skilled professionals on which our program depends.