

Testimony of

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I would like to thank the subcommittee for allowing me to testify today. I have dedicated my career to researching the science and technology surrounding the use of explosives for wide varying applications. I am an Associate Professor of Mining Engineering at the University of Kentucky. I received my B.S. and Ph.D. degrees in Mining Engineering from the University of Missouri-Rolla and I am a registered Professional Engineer in Kentucky. My research and teaching specialty is in the area of Industrial/Mine Blasting and Blast Mitigation. I have received the Mining Engineering Department Teacher of the Year Award in seven of the last nine years, the ISEE President’s Award in 2012, and the Dean’s Award for Excellence in Research in 2014. I have also developed a research program at the University of Kentucky that has been funded by federal, state and industrial organizations at a level exceeding \$5,000,000 in the last eight years. I am the Director of the University of Kentucky Explosives Research Team (UKERT). The research program has two major focal points. The first is blast mitigation research for the department of defense, department of homeland security, mining organizations, and federal contractors. The second focal area is research of public interactions with mine blasting including the response of structures to mine blasts. My research also includes optimizing blasting operations for fragmentation, productivity, product selection, and environmental effects. Recently, I have concluded two very successful projects for the National Institute for Hometown Security totaling nearly \$2 Million. The projects focused on infrastructure resiliency for power substations and commercial buildings. I have also been the Principal Investigator on three federal grants funded by the Office of Surface Mining and Regulatory Enforcement. My research specialties include numerical modeling using physics based models for high energy events, blast resistant testing and evaluation, and monitoring/analysis of vibrations for mining and industrial blasting. My research findings have been reported in over 70 publications.

In April, 2015, testimony regarding the Supporting Transparent Regulatory and Environmental Actions in Mining Act or the STREAM Act was requested by the Committee on Natural Resources. In particular, testimony was sought regarding the publication of scientific products from a researcher with experience managing federally funded grants under the guidance of the Office of Surface Mining and

Regulatory Enforcement (“OSM”). Since 2007, I have managed three specific federal grants funded by OSM including one ongoing grant. The OSM grants I have managed as Principal Investigator include:

1. Lusk, B (PI). “Blasting Effects on Coal Refuse Impoundment Structures.” Office of Surface Mining, August 2012 – August 2015 (Budget \$200,000).

The project is currently underway and has been extended through September of 2015. The project has three primary objectives including:

- Study of the generation of water pore pressure excess and particle velocity/acceleration in two impoundments due to dynamic loads produced by the mining production blasting activity in a surface coal mine.
- Computational evaluation of coal refuse impoundments subject to dynamic activity produced by production blasting in a surface coal mine.
- Determination of the best practices for blast design in a surface coal operation when impoundments are the structures under protection or close to the production area. The end result should be a guide to determine stability ratings or factors to consider when blasting near impoundment structures.

The results of this project will be reported to OSM in final reports and will be disseminated to the industry and the public through peer reviewed publications and presentations at regional and national conferences. Several graduate students have participated in this project already with one student planning completion of a PhD based on the project in the near future.

2. Lusk, B (PI), “Field Testing and Analysis of Blasts Utilizing Short Delays with Electronic Detonators.” Office of Surface Mining, September 2009 – September 2010 (Budget \$200,000)

In this study, three clear objectives were set:

- Determination and documentation of the accuracy of delay times in two specific programmable electronic detonator systems in comparison to the desired (nominal) time programmed into the detonators.
- Determination of accuracy in delay times for a select number of modern non-electric shock tube type millisecond delay series detonators.
- Observation and analysis of surface coal mine blast that utilize short delays intervals (<3 milliseconds between charges) and comparison of the results to conventional delay designs at the same location.

To accomplish the objectives, field and laboratory tests were performed. Along with the analysis of field and lab results, it was necessary to perform a theoretical investigation of timing in blast design. During the laboratory stage, the accuracy of delay times in electronic detonator and non-electric shock tube systems were determined. The field tests were conducted at a surface coal mine in West Virginia. During the field testing phase of the research, several mine blasts were recorded and analyzed. Some of the shots utilized short delay intervals lower than 8 milliseconds between charges. Finally, a tool for analysis of the blasts involving timing in the process was developed and adapted from the signature hole technique.

This project resulted in a number of peer reviewed publications, graduate student theses and dissertations, and comprehensive final reports submitted to OSM.

3. Lusk, B (PI), "Acoustic Response of Structures to Blasts Analyzed Against Comfort Levels of Residents Near Surface Coal Operations." Office of Surface Mining, September 2007-September2008. (Budget \$100,000)

The primary objectives of the proposed research include:

- Specific determination and documentation of how residents would experience a blast event from inside their homes.
- Collection of survey information from residents surrounding surface coal operations for analysis against groups not exposed to blasting and groups exposed to quarry blasting that were previously surveyed. Public relations tools will be generated from analysis of the survey results.

This project also resulted in a number of peer reviewed publications, graduate student theses and dissertations, and comprehensive final reports submitted to OSM.

Through completion of these projects I've developed new knowledge, findings, recommendations, and a wealth of raw data. In addition, talented future problem solvers have earned PhD and MS degrees in Mining Engineering. These individuals will take the skills and knowledge gained through working on these important projects and apply them toward solving the challenges of tomorrow. Furthermore, 50% of the graduate students that have earned advanced degrees under my advisement have been women, minorities, or military veterans. These underrepresented groups have benefited greatly from the research programs sponsored by OSM.

I was awarded a grant under the last solicitation that OSM funded for technology transfer projects in 2012. These grant programs were of great personal benefit to me and the graduate students that earned advanced degrees with the funding provided. In addition, the scientific products have been helpful to industry in solving problems associated with blasting at surface coal mines. The solicitations for technology transfer projects with OSM have not continued beyond 2012.

HR 1644 states in section 530-a-2:

"Federally funded scientific products -

For those scientific products receiving Federal funds in part, or in full, the Secretary shall also make publicly available—

- (A) the raw data used for the federally funded scientific product; and
- (B) background information of the authors of the scientific study"

It will be very important to define in the bill what is meant by raw data. I would consider raw data to be any information that was used to perform analysis or draw conclusions for reporting a scientific study. This raw data may have been obtained through numerical simulations, experimental studies, surveys, or even through literature review. There are many components of raw data that may be sensitive for any number of reasons. For example, some data may be sensitive because it produces information that would be considered classified or "for official use only". There are processes in place for handling these types of situations. Likewise, other information may be sensitive due to restrictions on personal information through HIPAA privacy and security provisions. Finally, raw data may be sensitive if it is considered intellectual property of a company that is providing match dollars, facilities, or other resources to the funded project. In all cases, processes are in place to protect sensitive data. Nevertheless, a majority of raw data collected under a federal grant could be collected as a deliverable with little hardship to the researcher which would serve great benefit to the scientific community and to lawmakers. In most cases for my projects (regardless of the funding source), I have included electronic

media in the form of DVDs, flash memory drives, or hard drives containing large amounts of raw data to accompany final reports to the sponsor.

It will also be important to define what is meant by background information. This information would likely include a comprehensive academic style CV for any author listed on the final report. The typical CV would include education, publications, funded research projects, and other pertinent information regarding the research credentials of an individual. This information would be very useful when considering the analysis and conclusions drawn within the scientific research product. The authors' expertise and capability to perform the funded research is important when assessing the validity. I would have no problem submitting background information for authors on reports for my funded projects. The information is usually collected during the proposal phase anyway.

Throughout my career as a researcher, I have always held that the sponsor of any research owned the scientific products resulting from any project. These scientific products are generally outlined in the deliverables of the proposal and contract; however, ownership of the raw data has always been something that I considered to be owned by the sponsor. In the case where federal or state funding was involved, I always considered the data and research products to be available to the public. There has never been much interest in this type of information by sponsoring agencies beyond final reports and deliverables specifically outlined in the contract.

Scientific research is often used as a tool in the rulemaking process. As such, raw data should be available for analysis to determine if experts in the field of research can reproduce the conclusions and observations reported in the research product. These research products include research reports, publications, and other documents stating conclusions based on data.

Requiring the delivery of all raw data associated with a scientific product of research would not add undue hardship to a researcher if this requirement is explicitly stated during the proposal phase. In this case, proper data management procedures could be developed to allow for seamless transition of data to the sponsor at the close of the project. The raw data could be packaged and delivered with the other deliverables including final reports, presentations, fact sheets, or other material. The researcher should not be responsible for making the data publicly available, nor should the researcher be responsible for the stewardship of the data beyond the contract dates unless otherwise specified.

Research findings are disseminated in several ways following research efforts. In many cases, research reports, peer reviewed journal publications, patents and creation of new products or processes, and public presentations are used as the medium for sharing research results. In many cases researchers in similar fields can find the raw data from projects useful for furthering knowledge and technology through additional analysis of the data. The research process requires that researchers define the research methodology so that it can be recreated by other researchers with similar qualifications such that similar conclusions can be drawn with the same raw data. Making raw data unavailable prevents this important step in the research process. The availability of raw data also allows for better utilization of federal resources by allowing multiple researchers to analyze data and draw additional conclusions or develop new knowledge and technology.

One example of a positive aspect of access to raw data from my personal experience involves an OSM grant that concluded in 2012. This particular project collected data about surface coal mine blasting for developing new methods for ground vibration control and prediction. The data has been used for multiple theses and dissertations and the scientific products are now being applied across

mining industry sectors. Specifically, the vibration prediction and control methodologies are being applied to highwalls for metal mines in the Western United States.

In short, as a tax payer that partially funds any federally funded grant, I believe that raw data produced with funding provided by federal sources is publicly owned and thus should be available for public review. Furthermore, scientific products utilized for rulemaking should be subjected to the same level of scrutiny as other traditionally accepted research products in the form of peer review. An important part of the peer review process is the ability to recreate analysis given similar data. With publicly sponsored research, this data should be readily available for review. I believe that this is true for research spanning all levels of scientific study. It is not confined to the very specific area that I perform research, but extends to any field of research where data is analyzed and conclusions are drawn.

It is almost universally hailed that transparency is positive for many administrative processes. Politicians announce that transparency is needed in rulemaking and in the process of regulations. Business owners and managers often say the same about business processes. As a researcher, part of transparency includes access to raw data from projects. I am in support of transparency in research. I would welcome such an endeavor in any federally funded research that I am a part of.

Thank you for your time in considering my opinion regarding this matter. I would be happy to answer any questions that may arise based on my testimony.