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To: zzMSHA-Standards - Comments to Fed Reg Group
Subject: RFI concerning diesel particulate matter, RIBN 1219-AB86
Attachments: Primary Draft.docx

I have attached my comments on the above-captioned RFI. Thank you for the opportunity.

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AB86-COMM-116

Comments on Proposed Rule-Making concerning the use of diesel powered equipment in underground mines.

Docket No. MSHA-2014-0031

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I wish to make comments about current rules covering miners' exposure to diesel particulate matter for both underground Metal and NonMetal mines and underground coal mines. These rules currently are inadequate for protecting miners' health and preventing lung cancer but for entirely different reasons. Lung cancer is almost always fatal [1]and consequently it is unacceptable to limit exposure to a level known to be insufficiently protective when improvements are possible in each rule that are both effective and feasible.

These comments include an Introduction, with some comments about lung cancer and the relationship between exposure to chronic health hazards, followed by three parts: Part 1 is a discussion of the need to reduce the PEL for diesel particulate matter in underground metal and non-metal (MNM) mines which is currently an 8 hour time-weighted-average (TWA) of 160_{TC} $\mu g/m^3$. A lower PEL is both feasible and necessary. Part 2 is a commentary on the importance of monitoring exposure to any health hazard in order to prevent adverse health effects. In particular, this is concerned with MSHA's failure to monitor coal miners' exposure to DPM in spite of having information that could be used to do so. Part 3 is a discussion of the need to update and improve exposure limits used for estimating the Ventilation Rate for diesel powered vehicles.

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[1] The five year survival rate for lung cancer is currently around 18%, according to the National Cancer Institute. This means that for persons with lung cancer, at five years from the date of diagnosis, 18% are still alive (or 82% have died). This is an improvement over previous years when the five year survival rate was about 15%; this improvement could be due as much to diagnostic techniques that can identify lung tumors earlier in the tumor's natural history than it is due to treatments that prolong life.

Introduction.

Lung cancer is the 2d most frequent cancer in the U.S. Although miners represent a small fraction of people in the U.S., even a small fraction off a large number could be significant. There are many lives at stake. In addition, lung cancer is almost always fatal. The leading cause of lung cancer remains smoking. Since many of the chemicals in smoking are also present in diesel particulates, it is not surprising that diesel particulates also cause cancer. Another measure of the significance of any cancer is the survival rate. The five year survival rate is the percent of persons alive five years from the initial diagnosis. The current five-year survival rate for lung cancer is about 18%. This means that after five years, 82% percent of people with lung cancer have died. Because of these characteristics, preventing cancer by reducing exposure to its causes is essential and, for diesel exhaust, measuring its concentration is essential to reducing exposure. If these parameters are not measured and if exposure is not reduced, it is impossible to lay any claim to controlling them and thereby reducing the risk of lung cancer arising from that exposure. In Metal and NonMetal (MNM) mines, bercause of the absence of confounding factors (i.e., such as coal dust), exposure can be measured and a reduction in exposure can be documented. The need in MNM mines is the same as the need in coal mines: to ensure that exposure is at its lowest feasible level. But if MSHA does not measure it, nobody knows what the exposure level is. Measuring exposure in coal mines is significantly confounded by the presence of coal dust which is essentially the same as DPM (elemental carbon) making a differential analysis all but impossible. This does not mean that one should give up on the need to measure exposure to DPM in coal mines. Yet that is what MSHA has done; it can and should do better as I explain below.

Regulations to control DPM exposure for underground Metal and NonMetal miners

The PEL applicable to Metal and NonMetal mines is the only exposure limit for diesel particulate matter among state and Federal regulatory agencies in the U.S. MSHA is to be congratulated that it has taken on this task. The information base for this PEL includes not only scientific research evaluating the exposure-response relationship

between DPM and lung cancer but is also based on research conducted by MSHA, mine operators, and miners' unions who cooperated to evaluate the feasibility of the proposed rule and giving it an empirical and timely foundation. (This was the "31 Mines" study.) Any additional effort to control exposure to DPM by any other agency in the U.S. will use the MSHA PEL as the benchmark. MSHA is acquiring considerable knowledge with control methods including engine design, engine maintenance, fuel quality, patterns of use, exhaust filters, and other control methods that will be useful to other users.

However, there have been two important changes since this rule was promulgated in 2008. First, recent research by NIOSH and the National Cancer Institute, based on a large population of miners over a long period of employment has shown adverse effects at lower levels. This investigation should be given significant weight because it involved a large population of miners, it included a long period of employment, and it had exposure records or their surrogates for that entire period.

The second change is that MNM mine operators have demonstrated that compliance with the current PEL (160_{TC} $\mu g/m^3$, 8 hour TWA) is feasible and that mine operators and miners can reduce and maintain actual performance that is below the current PEL. Research on lung cancer death rates and smoking clearly demonstrates that reducing exposure reduces the frequency of disease.

Regulations to control DPM exposure for underground Coal miners

Regulations for controlling exposure to DPM in coal mines are complex and spread over five different sections of 30 CFR. (See the Table Below) It would be useful to consolidate these regulations, such as in a pocket size publication, for convenience and to demonstrate coherence.

The principal factor impeding measurements of exposure is that diesel particulates are almost identical to coal particles; they are respirable in size (and on average smaller that coal dust particles) with a solid core of carbon, just like a coal dust particle. Current analytical techniques cannot distinguish one type of particle from another. Perhaps different and it is not possible to separate one particle from the

another and analyze them with sufficient precision. There are other methods for conducting an analysis but they are not feasible to employ in a working mine. Consequently, one must evaluate and control exposure to DPM in a coal mine indirectly.

Rules concerning DPM are in the following parts of 30 CFR:

Part	Topic	Reference to DPM
7, E	Testing by Applicant or Third Party; Diesel Engines intended for use in Underground Coal Mines	7.89 Particulate Index
36	Approval Requirements	
70	Mandatory health standards for underground coal mines	
70, T	Diesel Exhaust Gas Monitoring Diesel Powered Equipment	
72	Diesel Particulate Matter	
72.500, D	Diesel Emissions	72.500-520: DPM Emission Rates; Determination of emissions filter maintenance; Miner Training; Equipment Inventory
75	Mandatory safety standards for underground coal mines	
75 (325)	Diesel Fuel Requirements	
75 (1901, a)	Diesel Fuel Requirements	
75 (1901, c)	Diesel Fuel Requirements (Additives)	
75 (1907, b 2,3,5)	Permissible Diesel Engines	
75, T, 1900-1916	Diesel powered equipment: training of operators, maintenance workers, diesel fuel handling requirements, operation in permissible and non-permissible areas, fire suppression equipment, starting aids	

The concentration of DPM can be estimated by taking the ratio of total DPM emissions divided by the ventilation for that air course. The DPM emissions are currently measured (30 CFR 72.500 (a,b). Adding emission rates for all engines on that air course would give the total emissions; dividing this amount by the ventilation on that air course would give an estimate of the DPM concentration. Then compare that estimate with a suitable standard of performance. The only standard available is the

PEL that MSHA promulgated for MNM mines, 160_{TC} $\mu g/m^3$, MSHA could then enforce a minimum value of ventilation. It would not be appropriate to base enforcement on whether the concentration of DPM was less than the MNM PEL because that concentration cannot be measured and it has not been promulgated for use in coal mines. At the very least, MSHA could estimate exposure to DPM for the purpose of surveillance (not enforcement) in order to estimate miners' exposure to DPM. But simply to ignore the concentration of DPM – a carcinogen -- because it cannot be measured directly is not prudent; It permits exposure at an unknown and possibly high enough level to cause a fatal disease.

There is also another approach to estimating miners' exposure and that is to use the Particulate Index (PI). The PI is determined under Part 7.89; it is determined for a machine that is operated through a duty cycle, in a laboratory setting, during which the mass of DPM is collected and measured. The PI is the ventilation rate determined for each machine that is required to control the concentration of emissions to 1 mg/m^3. This bench-mark can be used to calculate the ventilation needed to control emissions to, for example, 100 $\mu g/m^3$, by increasing the ventilation ten-fold over the PI. This useful parameter appears quite useful but it is only derived in these rules and not included in any enforcement actions that MSHA could take – such as calculating the ventilation on an air course by using the PI for all machines on that air-course as described above. Curiously, the PI is not put on the engine's approval plate although the Ventilation Rate (for toxic gases) is. Put the PI on the approval plate. Without measuring concentration MSHA is failing in its essential task and that is to protect miners' health.
I urge MSHA to undertake this relatively simple and comprehensible task.

<u>Exposure to Toxic Gases in Diesel Exhaust.</u>

The regulations in 30 CFR (Parts 7, 36, 70, 72, or 75) include requirements for underground coal mine operators that are designed to control miners' exposure to toxic gasess to their TLVs (1972, 1973). (CO, CO2, NO, NO2) These requirements are inadequate for all these gases except for CO2. Let me briefly explain why. The TLV for CO (1972 and 1973) is 50 ppm for a time-weighted-average (TWA). This essentially treats CO as a chronic, rather than an acute hazard. This is inappropriate because the most common health effect of CO is acute poisoning. Headaches start to occur around

35 ppm and increase with the concentration and duration of exposure. Significant headaches occur at about 100 ppm, risk of death increases with prolonged exposure above 500 ppm, and so on. It is entirely possible for CO concentration to occur at high enough levels to cause impaired thinking and yet for the shift average be below 50 ppm thus depriving MSHA with data to support a citation for over exposure. There are chronic effects that need to be considered but acute effects are more common. CO is present in diesel exhaust but the more most common source of CO is gasoline engines. I suggest that MSHA adopt the NIOSH REL for CO.

NO and NO2 are also included in diesel exhaust but more commonly occur as a byproduct of blasting. NO converts to NO2 in air so that when there is a danger of exposure to either gas, both should be measured over time. The current TLV for NO2 is a ceiling limit of 5 ppm with no TWA limit. This is inadequate. Scientists that conduct research on the health effects of NO2 consider 0.6 ppm to be "high" and 1.0 ppm to be "very high." It is feasible to reduce the limit for both a ceiling limit and a TWA and I think it should be done.

These gases occur together in diesel exhaust and at least NO and NO2 have the same effect. There is a formula for TLVs that suggests a TLV for mixtures of gases with similar effects that would be appropriate. Briefly, for such a mixture, an overexposure exists if the sum of the ratios of the concentration of any individual gas to its TLV is greater than 1. MSHA should adopt this formula.

If the TLVs for diesel exhaust gases are reduced, this would result in a higher Ventilation Rate (30 CFR 7.88) that would very likely be sufficient to reduce DPM to a low level also.